A METEOROLOGICAL STUDY OF THE HIGH SULPHATE AND NITRATE WET DEPOSITION EPISODES IN ONTARIO

Volume 2

FEBRUARY 1992

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A METEOROLOGICAL STUDY OF THE HIGH SULPHATE AND NITRATE WET DEPOSITION EPISODES IN ONTARIO

Bhartendu Srivastava

Atmospheric Environment Service Ontario Region

David Yap

Air Quality & Meteorology Sec., Ministry of the Environment

Neville W. Reid

Atmo. Res. & Special Prog. Sec., Ministry of the Environment

Volume 2

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Ontario

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APPENDIX I

Narratives for 1985

Summary

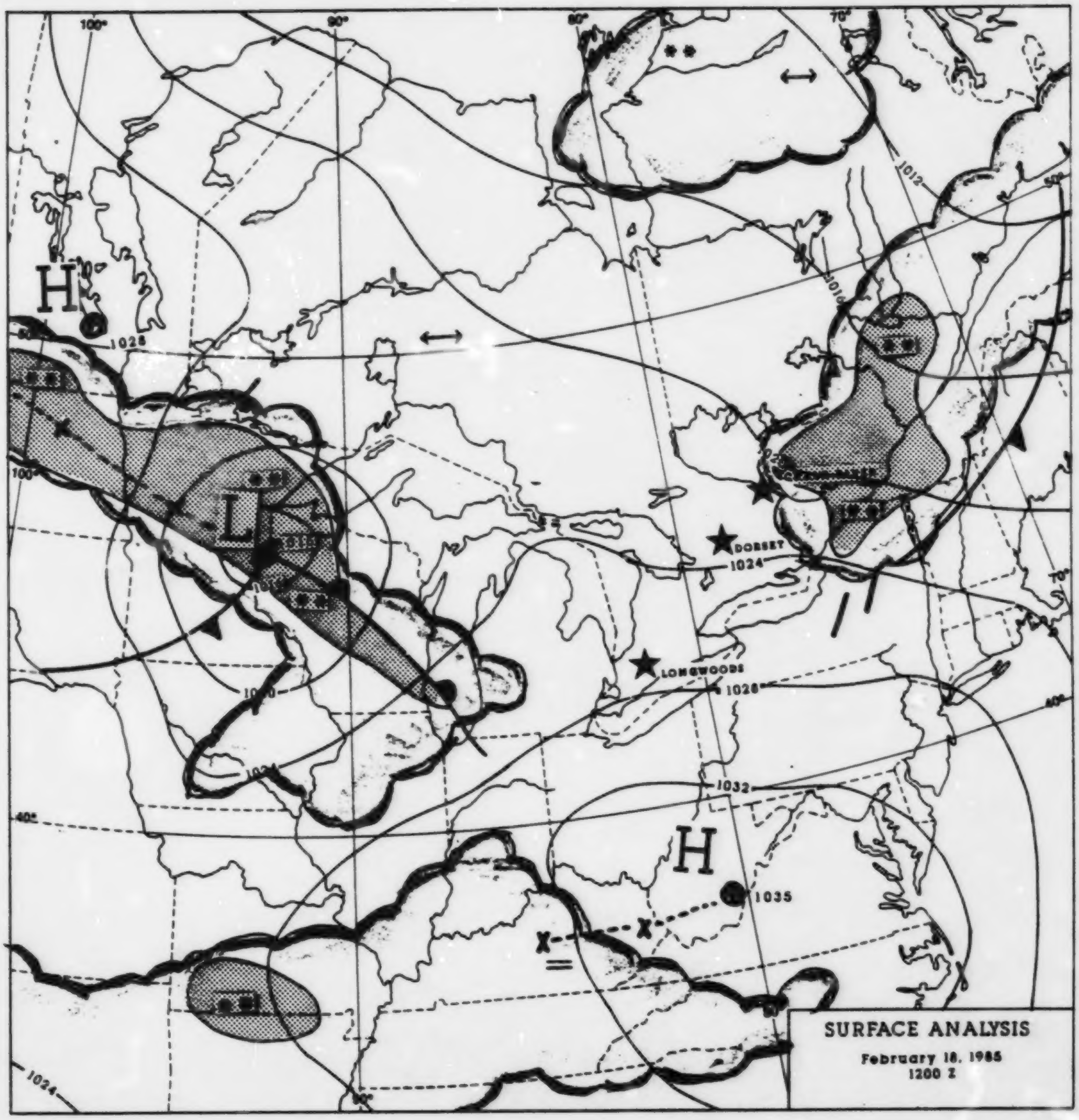
This is Volume 2 of the report titled ' A Meteorological Study of the High Sulphate and Nitrate Wet Deposition Episodes in Ontario', number ARB-164-91, published in three volumes.

This volume contains Appendix I of the report describing the narratives of 31 (#1.1 to 1.31) high $SO_4^=$ and NO_3^- wet deposition episodes in 1985 at Chalk River, Dorset, Longwoods (AES) and Longwoods (MOE). Each narrative describes the meteorological conditions yielding various types of precipitation in the area of the station(s), 72-hour backward air trajectories at 1000 mb, 925 mb, 850 mb and 700 mb levels and a brief summary. Surface synoptic maps at the beginning (mostly at 12Z on the starting day) and the end of the episodes (mostly at 12Z on the termination day), precipitation plots giving types, intensity and duration, and backward trajectories at the synoptic hours (12Z, 18Z, of the first day and 00Z, 06Z and 12Z of the following day) at the four levels are included.

Volume 1 contains the discussion of these episodes and includes the main text of the report.

1.1 February 18-19, 1985, Dorset

This episode ranked the highest (1/12) for NO_3^- top 25% wet deposition events. It did not count in the list of $SO_4^=$ events.
A low pressure centre of 1015 mb located north of Minneapolis, Minnesota on Feb. 18, at 12Z (Fig. 1.1.1) and associated with a frontal system travelled in an eastward direction to lie west of Chalk River on Feb. 19, at 12Z (Fig. 1.1.2) and deepened to 1008 mb. On Feb. 19 firstly a warm front during 00-06Z and then a cold front during 06-12Z passed over Dorset. Although no observations are made at the nearby weather station Muskoka during 03-11Z, synoptic maps indicated precipitation occurrence at the site during this period. Light snow(S-) was recorded at Muskoka during 00-03Z, as shown in the Fig. 1.1.3, likely due to the passage of warm front. The light snow showers(SW-) during 11-12Z are due to the cold front. The observations on February 18 of SW- during 1245-1400Z and very light snow shower(SW--) at 1415 appear to be due to early morning streamers off Georgian Bay.
The 72 hour backward trajectories for 1000 mb, 925 mb, 850 mb and 700 mb levels at Dorset for Feb. 18, 12Z, 18Z and Feb. 19, 00Z, 06Z and 12Z are shown in Figures 1.1.4, 1.1.5, 1.1.6, 1.1.7 and 1.1.8 respectively.
Air parcel arriving at the 1000 mb level on Feb. 18, 12Z travelled in approximately SW direction passing over Tennessee, Kentucky, Indiana, Ohio, Michigan and southern Ontario as shown in Fig. 1.1.4. Backing gradually during the episode, on Feb. 19, 12Z the trajectory crossed over Georgia-Tennessee-North Carolina border area, Tennessee, Kentucky, Kentucky-Ohio- West Virginia border area, Pennsylvania, New York and southern Ontario.
Air parcel arriving at the 925 mb level on Feb. 18, 12Z travelled approximately in a WNW direction passing through Manitoba, NW Ontario, Michigan and southern Ontario and the trajectory at 18Z did not change much (see Fig. 1.1.5). The trajectory then backed. On Feb. 19, at 06Z & 12Z the 925 mb trajectories were similar to that of 1000 mb (see Figures 1.1.7 and 1.1.8).
At the 850 mb level on Feb. 18, at 12Z & 18Z, air parcels travelled in a similar path as those of the 925mb level. Backing progressively the trajectory on Feb. 19, at 12Z lied over South Dakota, Iowa, Missouri, Illinois, Wisconsin, Michigan and Lake Huron and central Ontrio (see Fig. 1.1.8).
Air parcels arriving at the 700 mb level on Feb. 18, 12Z, 18Z and Feb. 19, 00Z travelled in a similar path as those reaching at the 850 mb level as shown in Figures 1.1.4- 1.1.6. The trajectory backed and on Feb. 19, at 06Z travelled over South Dakota, Nebraska, looping in Kansas and then over Missouri, Iowa, Illinois, Michigan and southern Ontario. The trajectory then veered to lie over North Dakota, Minnesota, Wisconsin, Michigan, Lake Huron and central Ontario on Feb. 19, at 12Z as shown in Fig. 1.1.8.
Summarizing, it appears that the passage of warm and cold fronts yielded snow and snow showers and pollution(NO_x) was mostly transported at low levels (1000 mb & 925 mb) from the Detroit area in Michigan, Ohio and West Virginia.


100°
90°
80°
70°
50°
40°
H
L
H
1028
1024
1028
1032
1035
1012
1016
DORSET
LONGWOODS

SURFACE ANALYSIS
February 18, 1985
1200 Z

FIGURE 1.1.1

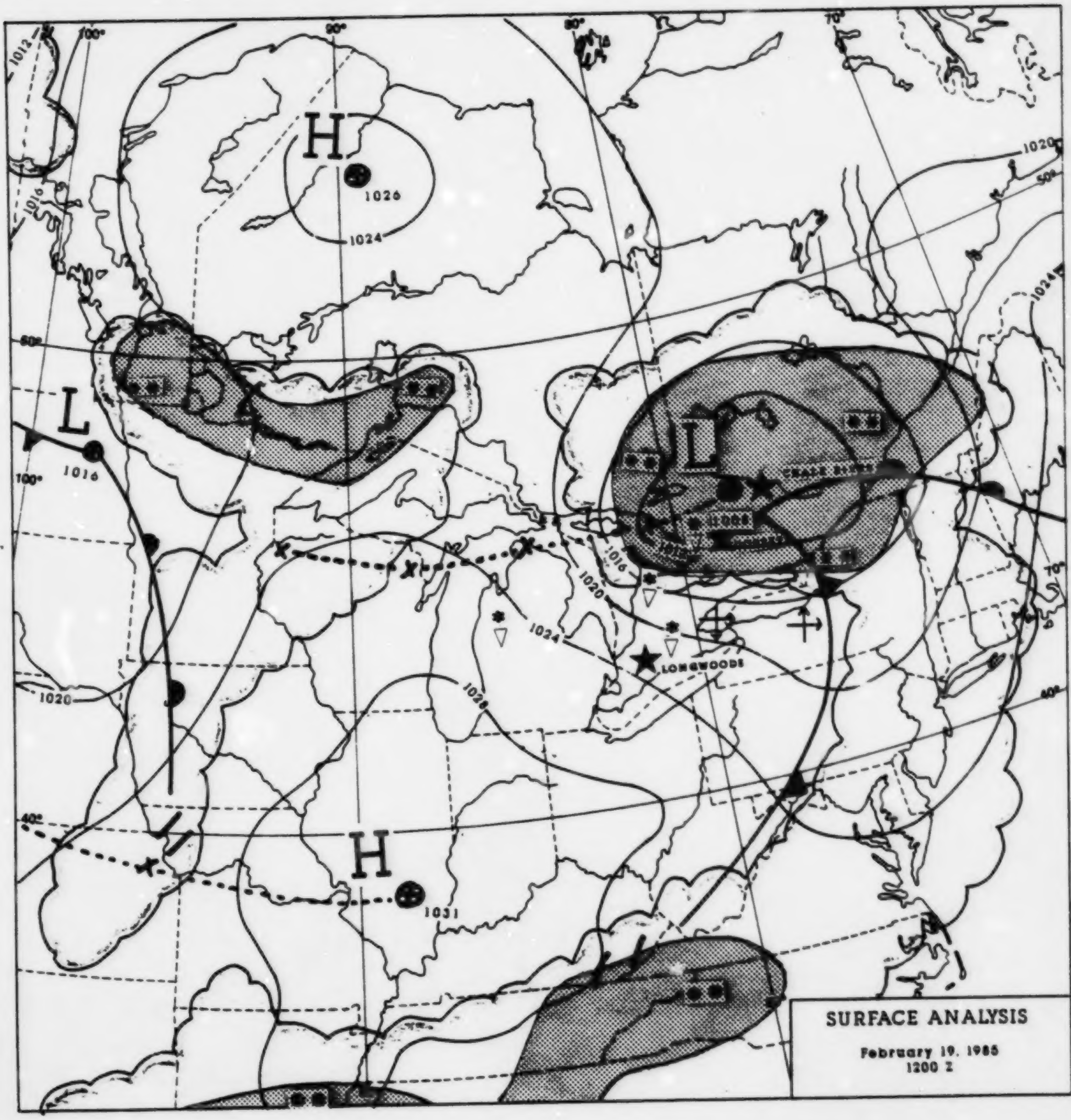

SURFACE ANALYSIS
February 19, 1985
1200 Z
H
1026
1024
L
1016
1012
1016
1020
1024
1028
H
1031
L
1016
1020
1024
CHALK RIVER
LONGWOODS
100°
90°
80°
70°
60°
50°
40°

FIGURE 1.1.2

Muskoka A
Feb. 18-19, 1985

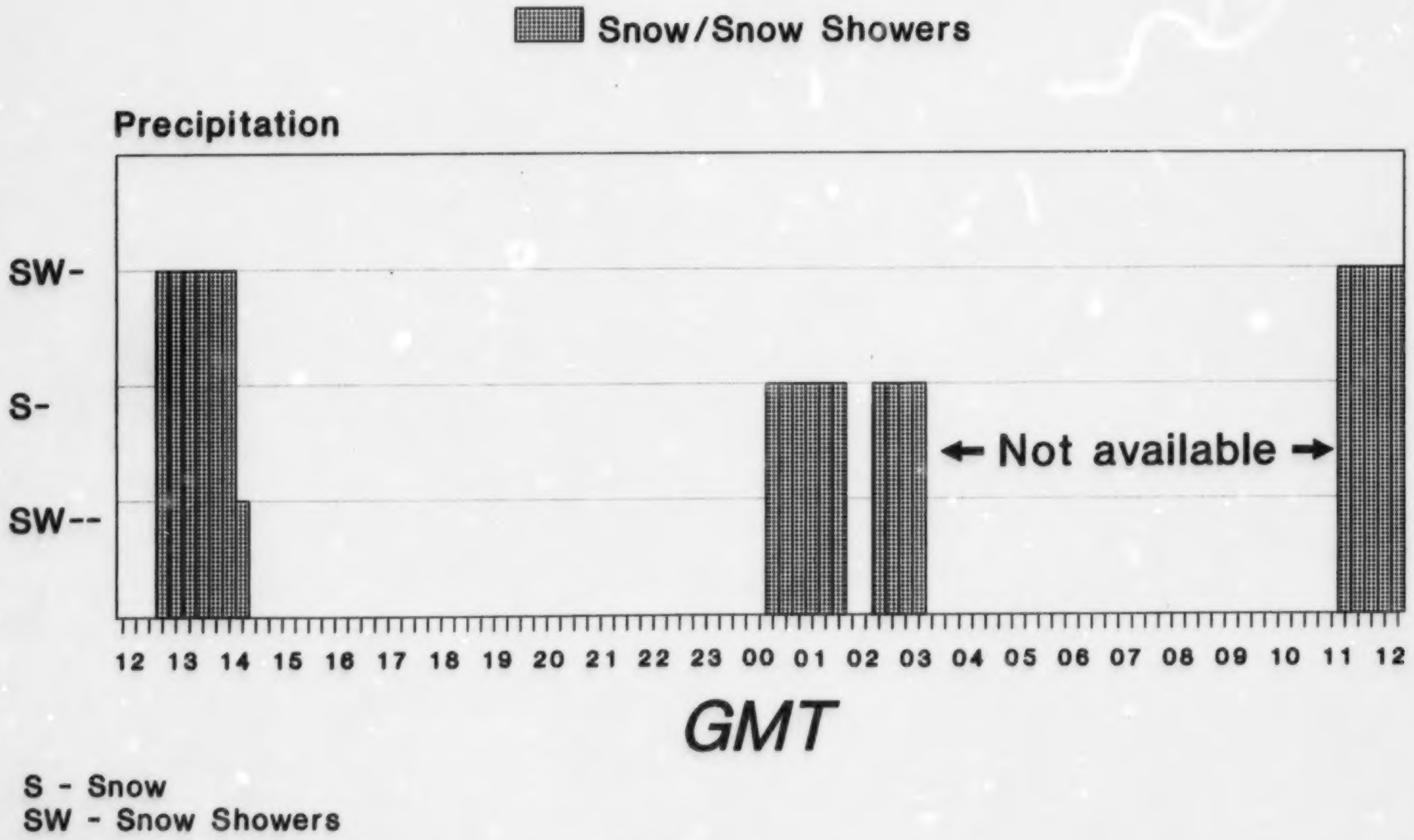


FIGURE 1.1.3

72 HOUR TRAJECTORIES
MON FEB18 85 12 Z

DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □

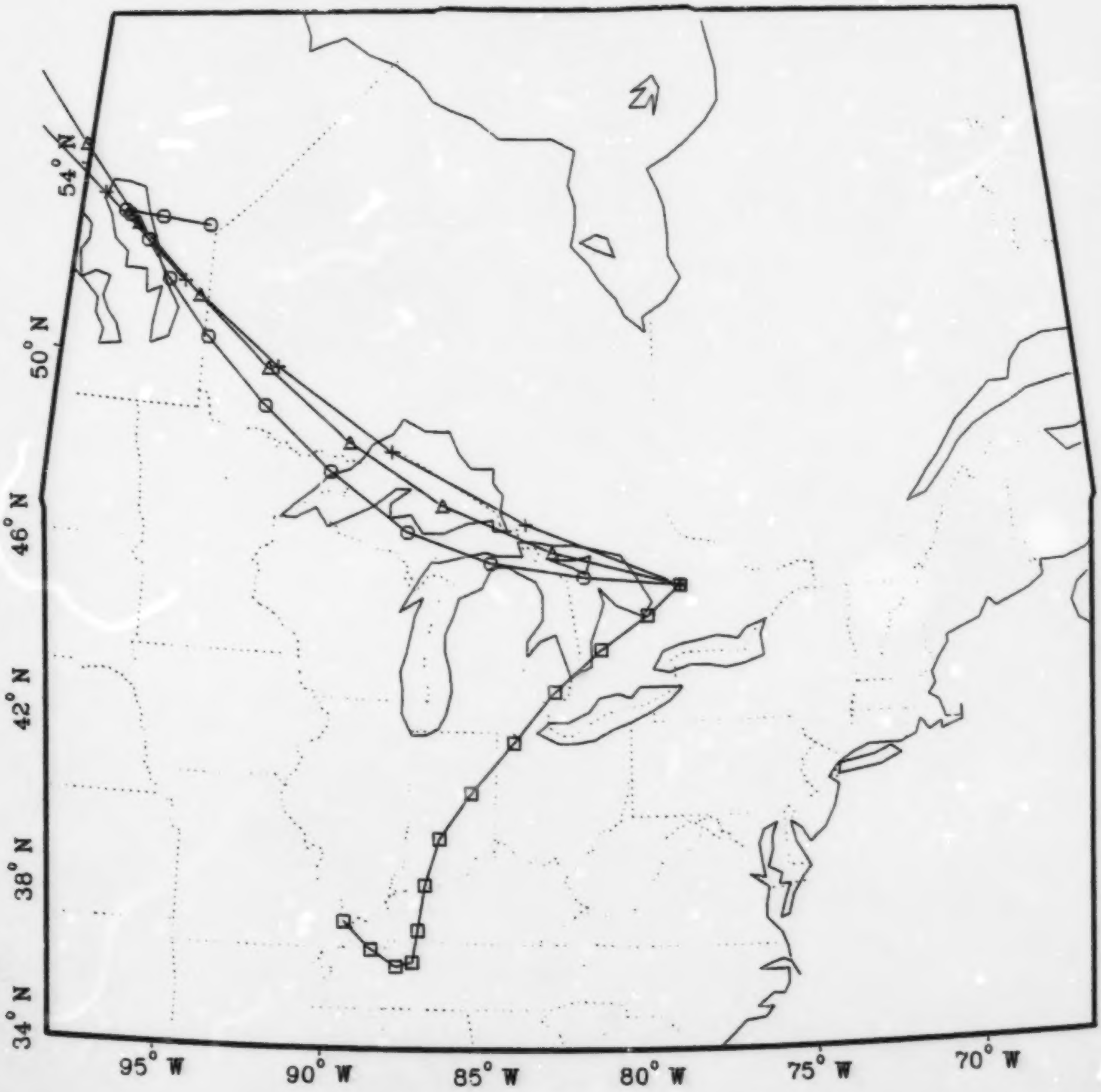

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.1.4

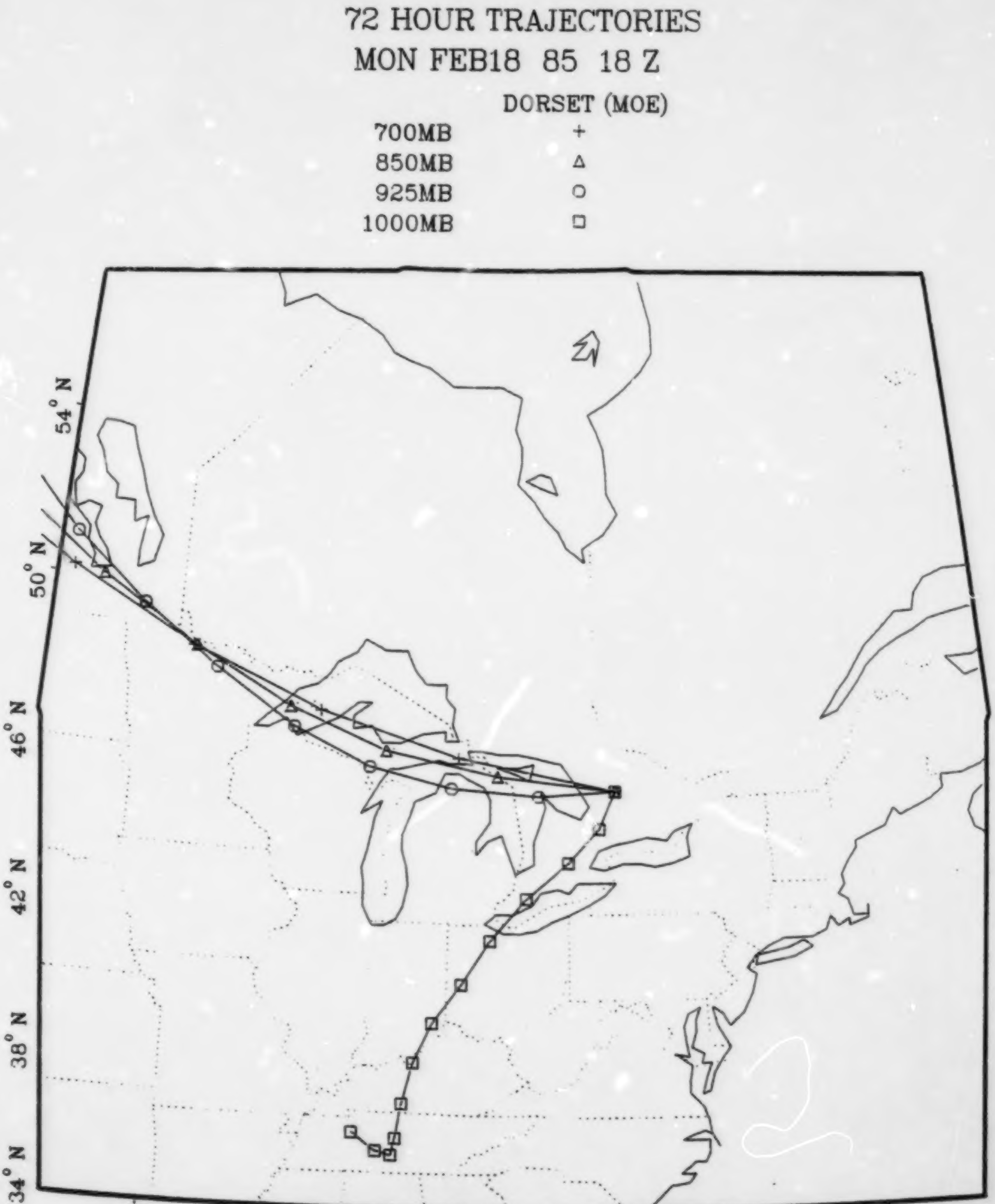

72 HOUR TRAJECTORIES
MON FEB18 85 18 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.1.5

72 HOUR TRAJECTORIES
TUE FEB19 85 0 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □

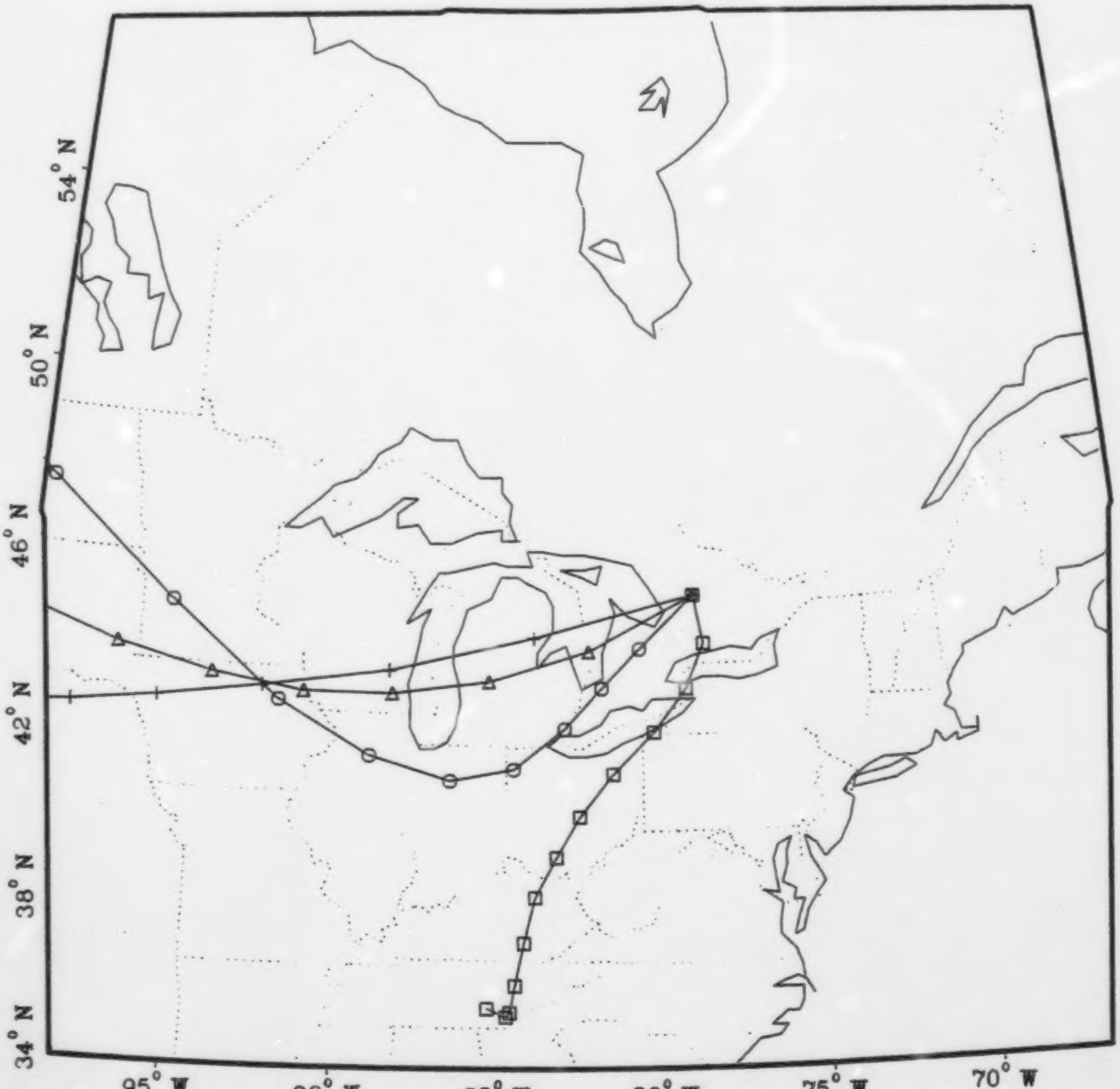

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.1.6

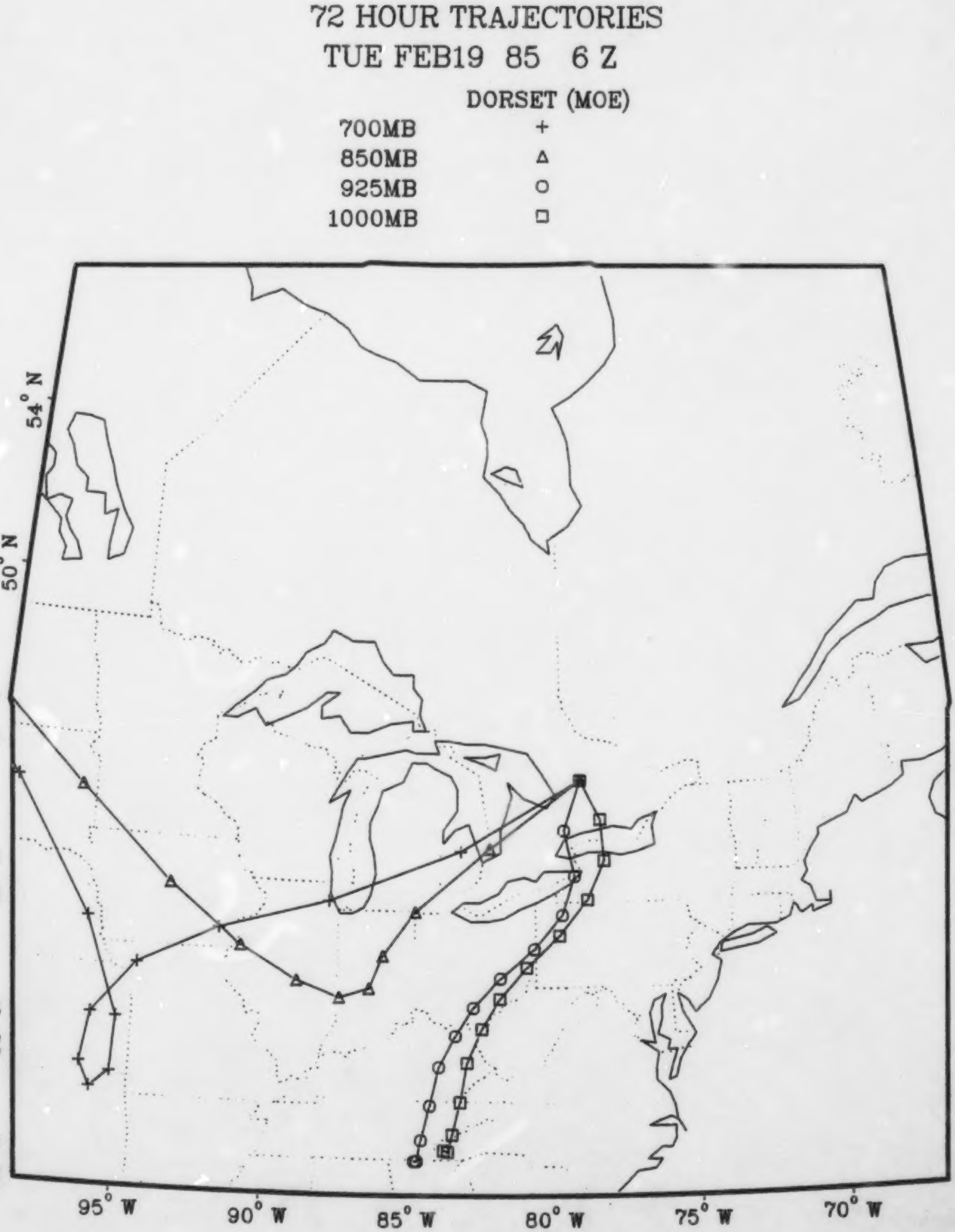

72 HOUR TRAJECTORIES
TUE FEB19 85 6 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.1.7

72 HOUR TRAJECTORIES
TUE FEB19 85 12 Z

	DORSET (MOE)
700MB	+
850MB	Δ
925MB	○
1000MB	□

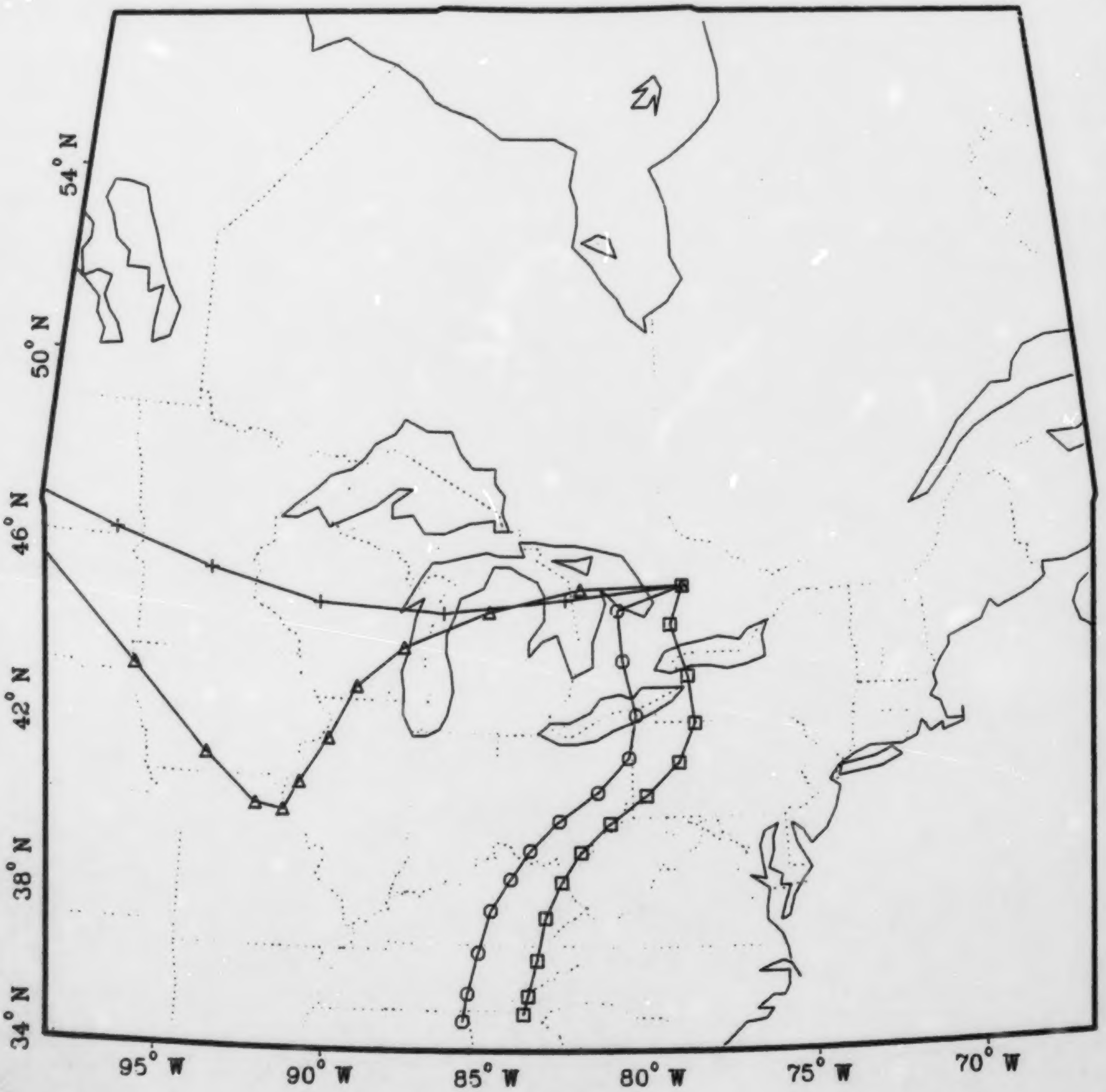

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.1.8

1.2 February 21-22, 1985. Dorset

This episode ranked 11th (11/12) only in the top 25% NO_3^- wet deposition episodes.

On Feb. 21, at 12Z three low pressure centres, each associated with frontal systems, were analyzed as shown in Fig. 1.2.1. The upper low in northern Ontario near Lansdowne House associated with a frontal system did not affect Dorset, and moved to lie over Northern Quebec on Feb 22, at 12Z as shown in Fig. 1.2.2. The middle low of 1007 mb near Thunder Bay on Feb. 21, at 12Z (see Fig. 1.2.1) moved in ENE direction to lie over Quebec near Matagami slightly deepening to 1006 mb. The warm front associated with this low passed over Dorset during night hours(03-11Z) when observations are not made at Muskoka. Synoptic maps(not exhibited here) indicated that rain fell during these hours. As shown in Fig. 1.2.3, rain showers and rain were observed outside the missing observation period. A trowl associated with the bottom low centre over NW Kansas(not shown in Fig. 1.1.1) on Feb. 21, 12Z, was over the station on Feb. 22, 12Z(see Fig. 1.2.2) and this as well as the frontal system with the middle low pressure centre gave a large area of continuous precipitation with Dorset located in it.

The 72hr backward trajectories for Feb. 21, 12 & 18Z and Feb.22, 00Z, 06Z and 12Z are shown in Fig. 1.2.4, 1.2.5, 1.2.6, 1.2.7 and 1.2.8 respectively.

Air parcel arriving Dorset at 1000 mb on Feb 21, at 12Z, travelled over Illinois, Indiana, Ohio, Detroit in Michigan and southern Ontario and changed its trajectory path during the episode as illustrated in Figures 1.2.4 to 1.2.8, showing that pollutants(NO_x) from Detroit and Ohio would have been carried to the station.

Air parcel arriving on Feb. 21, at 12Z at 925 mb level(see Fig. 1.2.4) travelled over Chicago, one of the highest NO_x emission area. The trajectory then backed and passed over high emission areas in Ohio, and Virginia and Detroit as shown in Figures 1.2.5-8.

The trajectories for 850 mb level show(see Figures 1.2.4-1.2.8) that on Feb. 21, at 12Z pollution from Chicago area and on Feb. 21, 18Z, and Feb. 22, 00-06Z, from high area bordering Missouri and Illinois (see Figure **emission map for no_x**) would have been transported.

Air parcels arriving at 700 mb level, as shown in Figures. 1.2.4-1.2.8, could have carried pollution from Chicago area from Feb 21, 18Z to Feb. 22, 06Z(see Figures 1.2.5-7).

In summary, it appears that a warm front passage and trowl over the station yielded rain and rain showers and pollutant(NO_x) at low as well as high levels could have been transported from the highest emission area in Chicago, and high areas of Detroit, and Ohio, Virginia, Illinois & Missouri states.

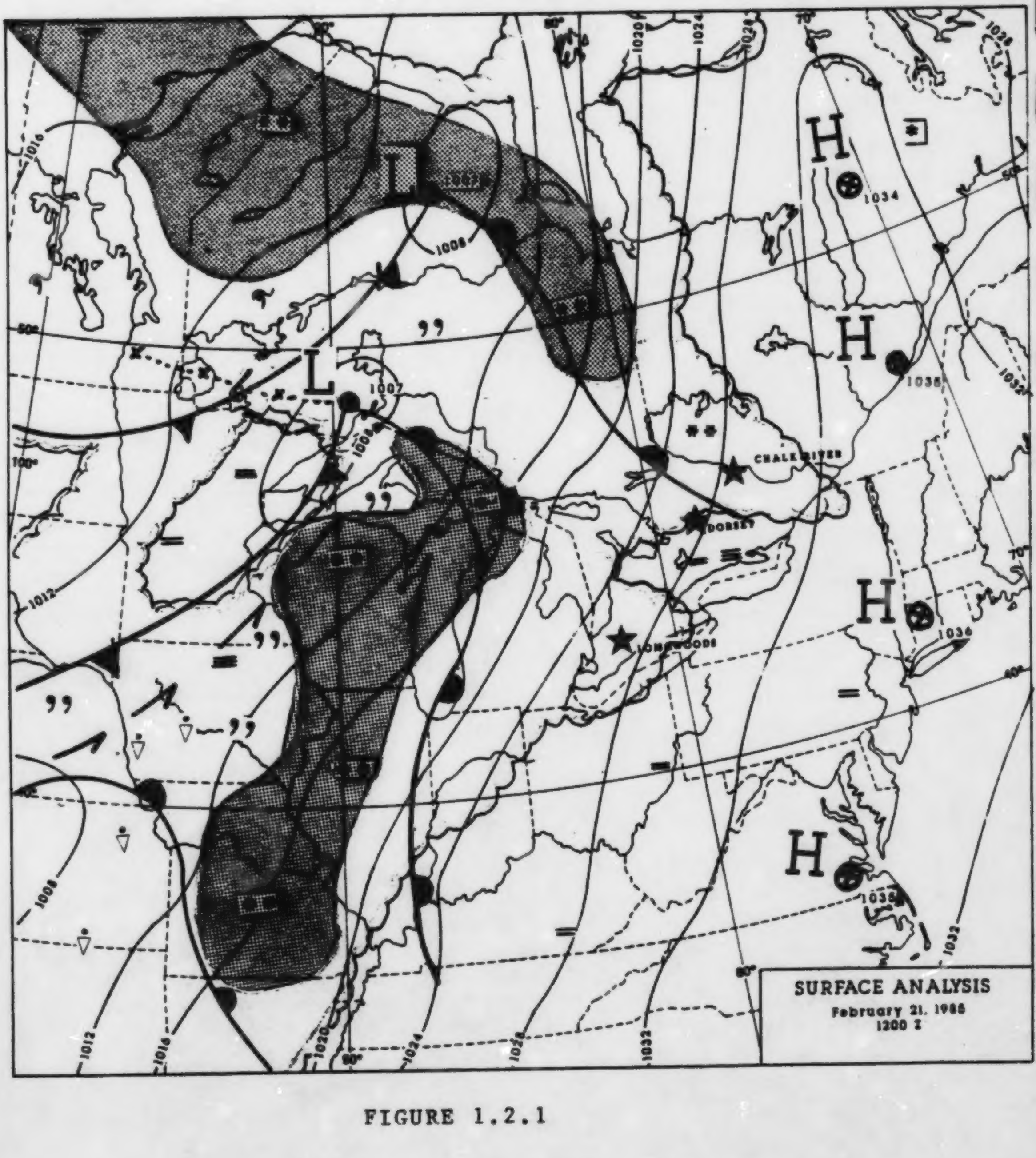

SURFACE ANALYSIS
February 21, 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
H
L
1034
1036
1032
1028
1024
1020
1016
1012
1008
1007

FIGURE 1.2.1

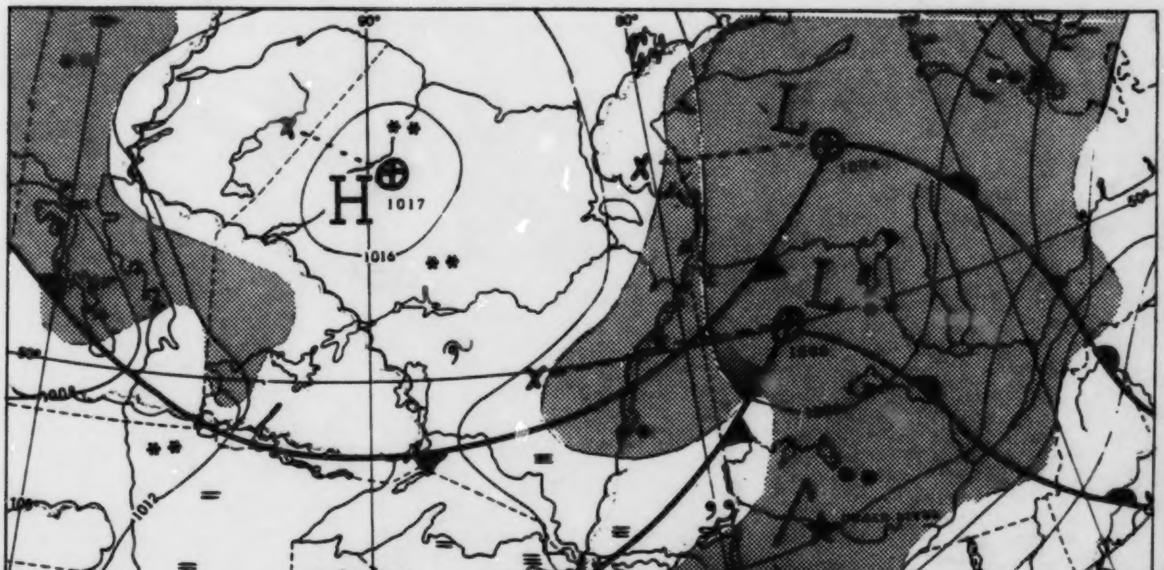
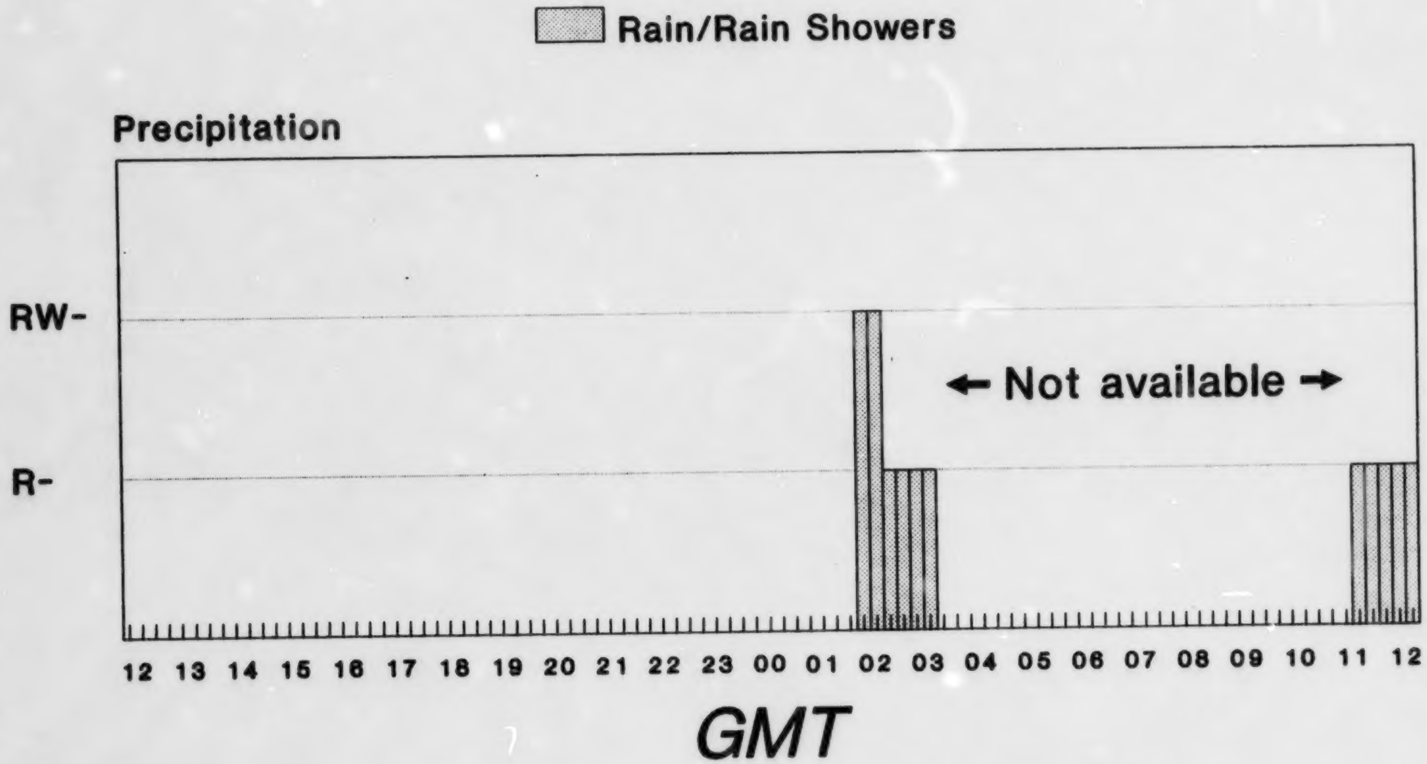

SURFACE ANALYSIS
February 22, 1985
1200 Z
H
1017
1016
L
L
H
1017
1016
L
1013
1012
1008
1016
1024
1028
1032
LONGWOOD
90°
80°
70°
50°
40°
100°

FIGURE 1.2.2

Muskoka A
Feb. 21-22, 1985

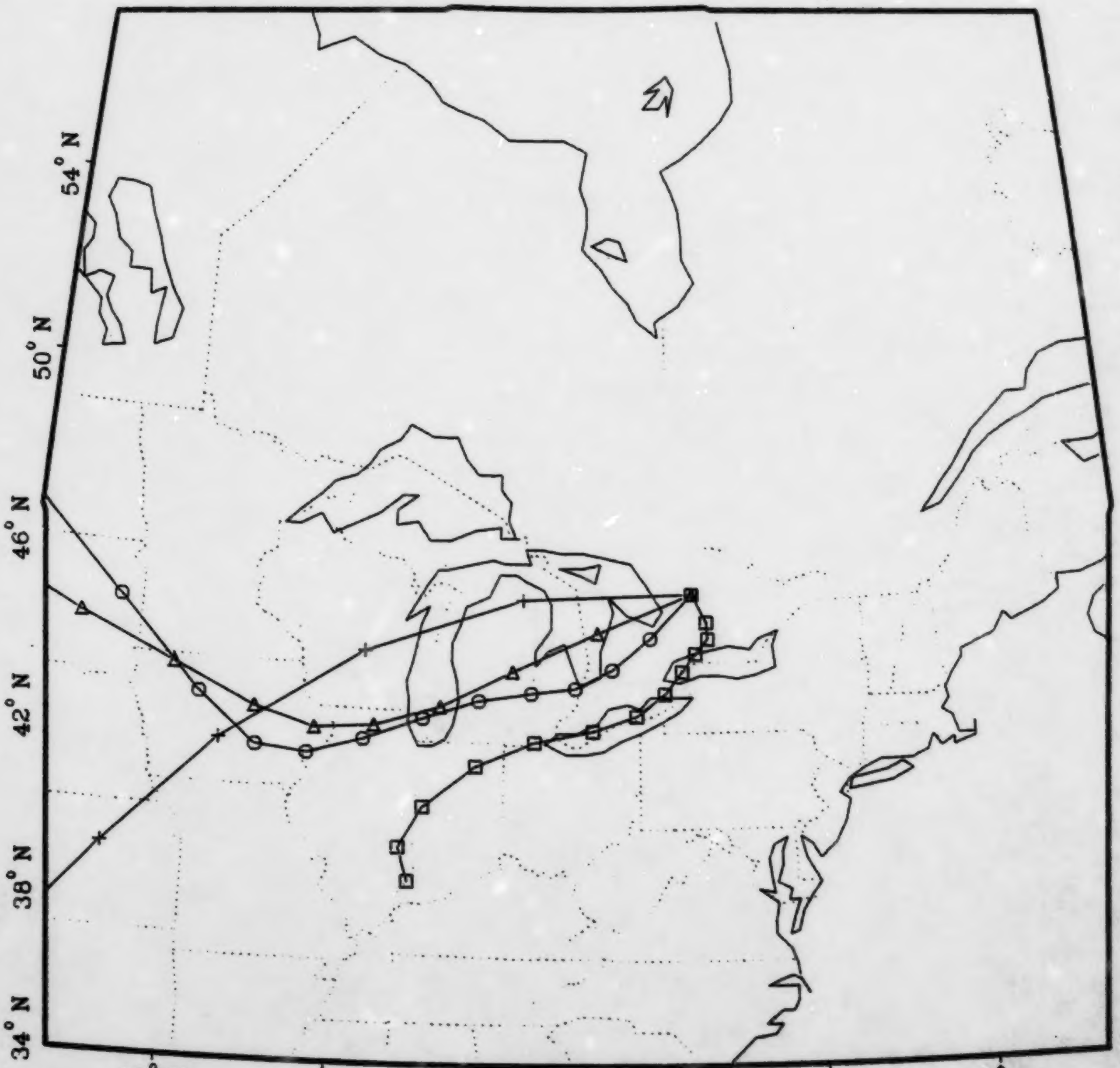


R - Rain
RW - Rain Showers

FIGURE 1.2.3

72 HOUR TRAJECTORIES
THU FEB21 85 12 Z

	DORSET (MOE)
700MB	+
850MB	Δ
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.2.4

72 HOUR TRAJECTORIES
THU FEB21 85 18 Z

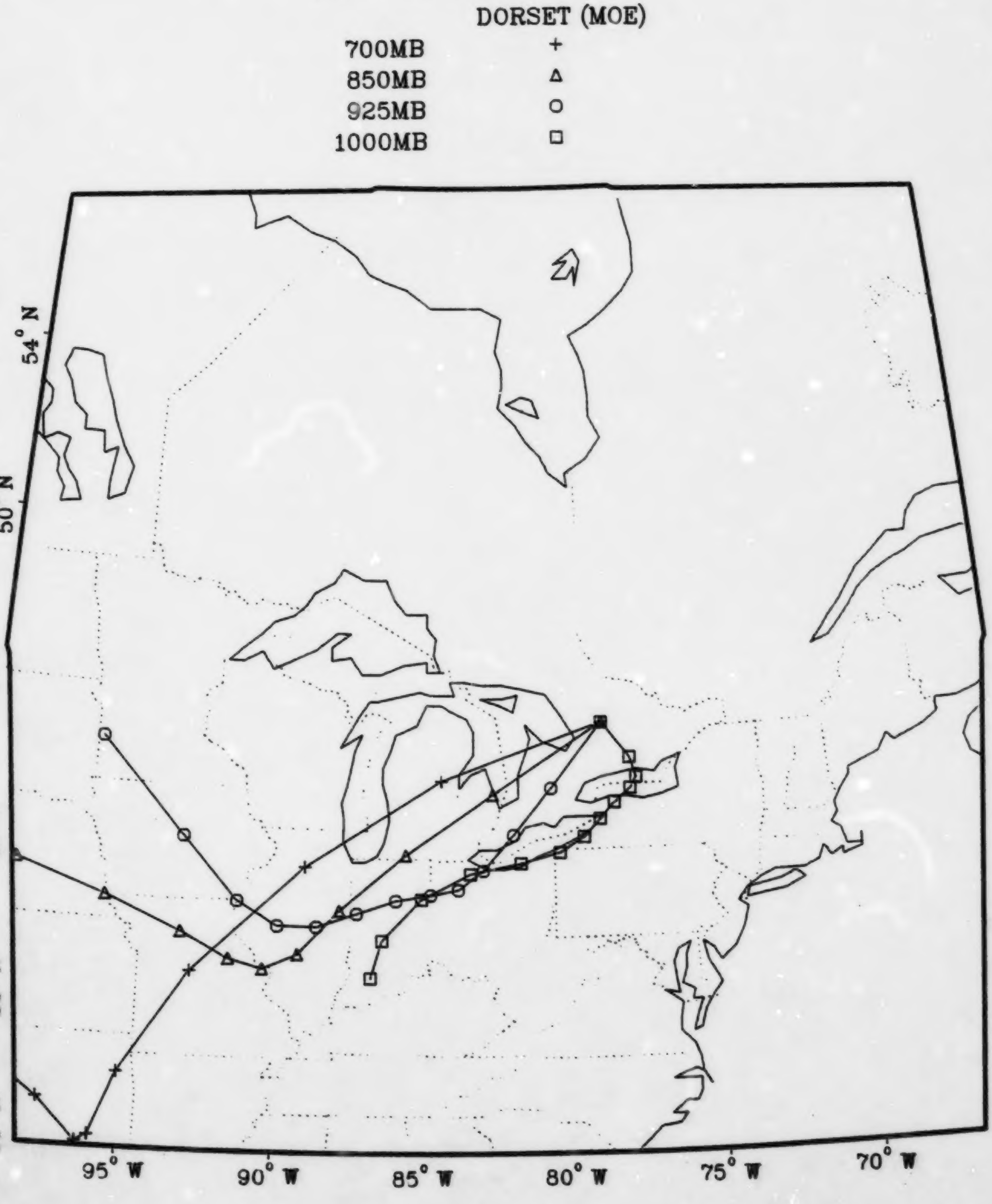
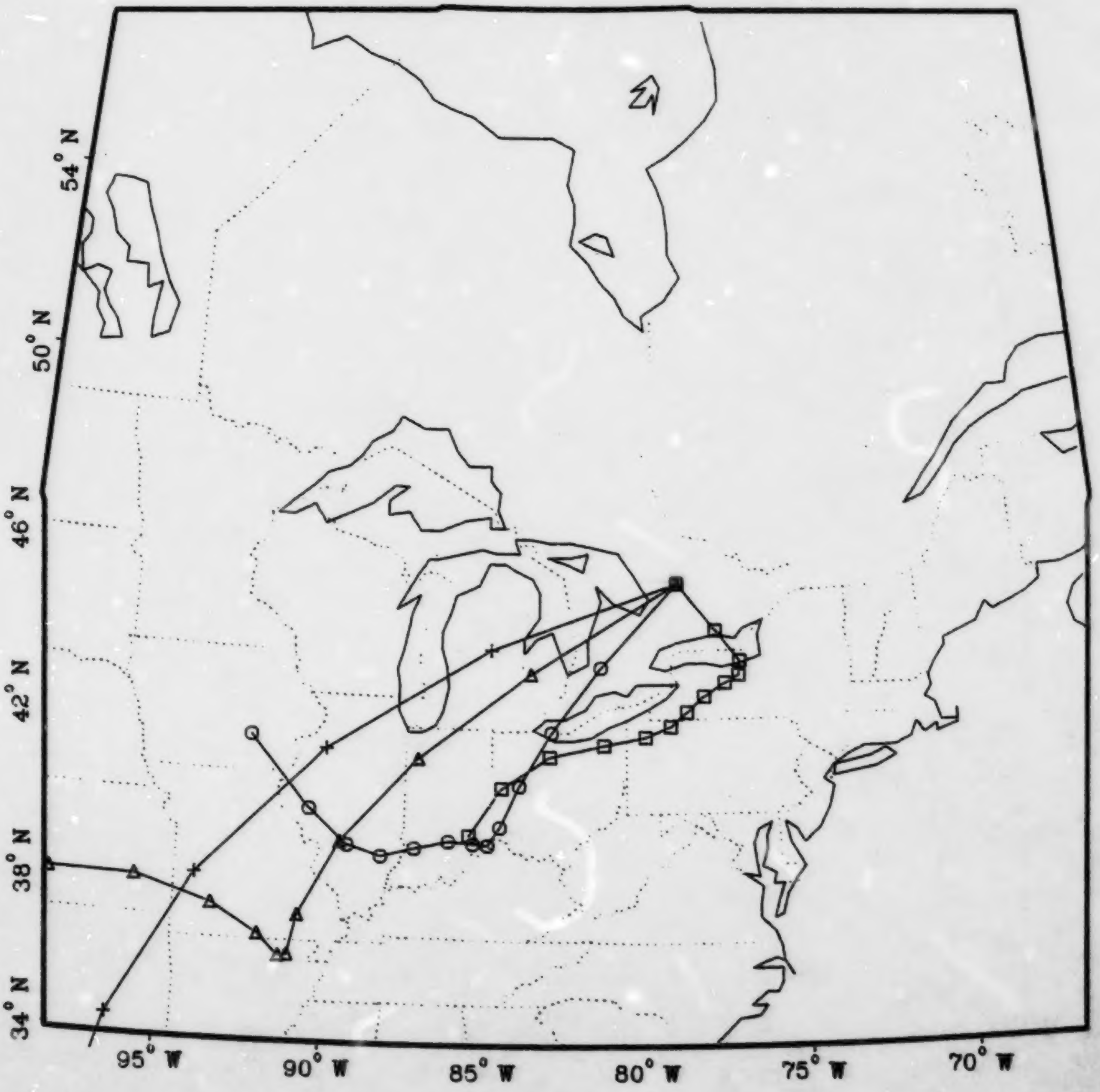

DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.2.5

72 HOUR TRAJECTORIES
FRI FEB22 85 0 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.2.6

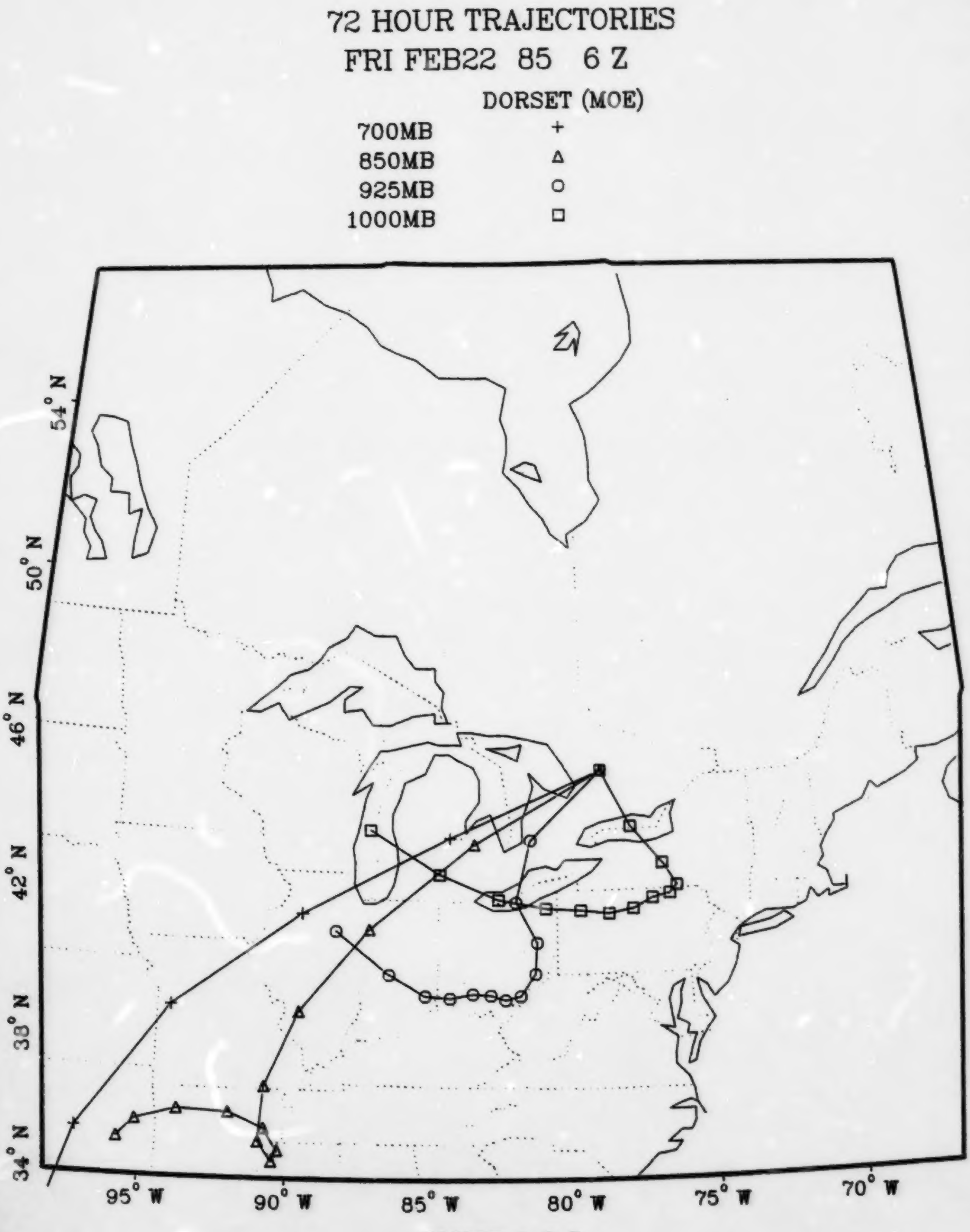

72 HOUR TRAJECTORIES
FRI FEB22 85 6 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.2.7

72 HOUR TRAJECTORIES
FRI FEB22 85 12 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

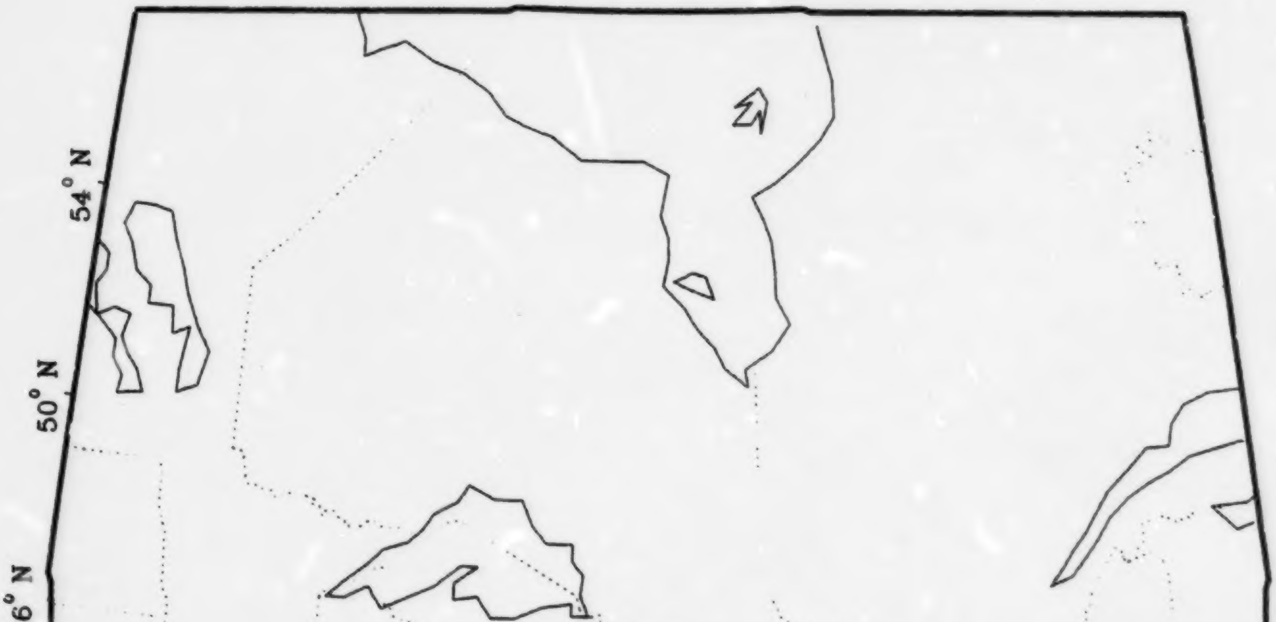

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.2.8

1.3 February 23-24,1985, Longwoods

This event was ranked 7th (7/8) and 5th (5/10) in the respective lists of $SO_4^=$ and NO_3^- top 25% wet deposition episodes at Longwoods (AES). At the MOE station, the episode ranked 7th (7/10) for NO_3^-.

Three low pressure centres, each associated with frontal systems as shown in Fig. 1.3.1 were analyzed on Feb. 23, at 12Z. The upper low of 1017 mb near Thunder Bay filled rapidly. The middle low of 1013 mb over central Michigan on Feb 23, 12Z (see Fig. 1.3.1) was associated with a stationary front over Lake Huron-central Ontario in an EW direction and yielded continuous precipitation with rainfalls of heavy(R+), moderate(R) and light(R-) intensity at London, the nearest weather station to Longwoods. As the southern Ontario remained under the influence of the stationary front throughout the episode, precipitation fell for most of the next 24 hours. The southern(lower) low of 1010 mb over Missouri on Feb. 23, 12Z deepened and moved in NE direction. By Feb. 24, 12Z, as shown in Fig. 1.3.2, a low pressure centre of 1004 mb over southern Ontario with warm front over Toronto and Longwoods in warm sector was analyzed. The large continuous precipitation area had passed over the station with London recording light drizzle as exhibited in Fig. 1.3.3. Fog occurred at London throughout the episode.

The 72hr backward trajectories for 1000 mb, 925 mb, 850 mb and 700 mb levels at Longwoods for Feb. 23, 12Z, 18Z, and Feb. 24, 00Z, 06Z and 12Z are illustrated in Figures 1.3.4, 1.3.5, 1.3.6, 1.3.7 and 1.3.8 respectively.

Air parcels arriving at 1000 mb level during the episode(see Figures 1.3.4-8) travelled such that pollutants(NO_x,SO_2) from the high NO_x and highest SO_2 emission areas in Ohio, Virginia and Pennsylvania could have been transported to Longwoods.

The air trajectories at 925 mb levels are such that(see Fig. 1.3.4-8) NO_x from high emission area in Ohio and moderate and low emission areas in Indiana,Kentucky, Ohio, Tennessee and North Carolina and SO_2 from high, moderate and low emission areas in these states could have been transported. The highest emission areas did not seem responsible for transport at this level.

The air trajectories at 850 mb and 700 mb levels are not significantly different from each other (see Figures 1.3.4-8) and also did not much change. At 850 mb level, NO_x from high emission area in Detroit and moderate-low emission areas in Ohio, Indiana, Illinois, Missouri, Arkansas-Mississippi border areas could have been transported. Also SO_2 from the highest emission Detroit area and high, moderate & low emission areas in these states could have been carried at this level. At 700mb level, transport from the highest SO_2 emission and high NO_x emission areas in Illinois - Missouri border regions as well as other states involved in the 850 mb level was also probable.

In summary, a stationary front and the passage of a warm front at the station yielded rain or rain & drizzle throughout the episode. Pollutants (NO_x & SO_2) from several emission areas in a number of states could have been transported at low (1000 mb & 925 mb) and high (850 mb & 700 mb) levels to Longwoods.

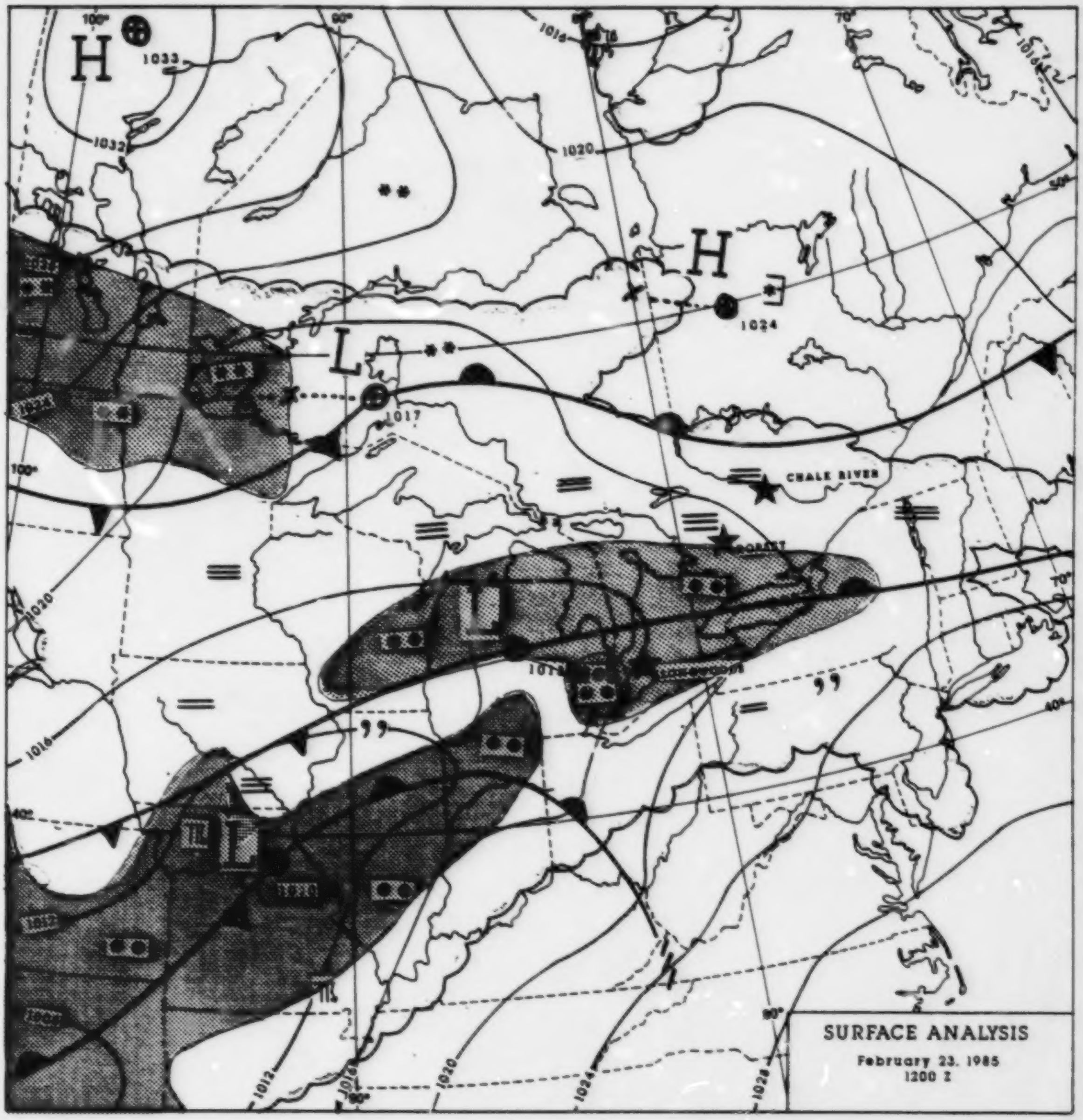

H
1033
1032
1016
1020
H
1024
L
1017
CHALK RIVER
L
L
1012
1016
1020
1024
1028
SURFACE ANALYSIS
February 23, 1985
1200 Z

FIGURE 1.3.1

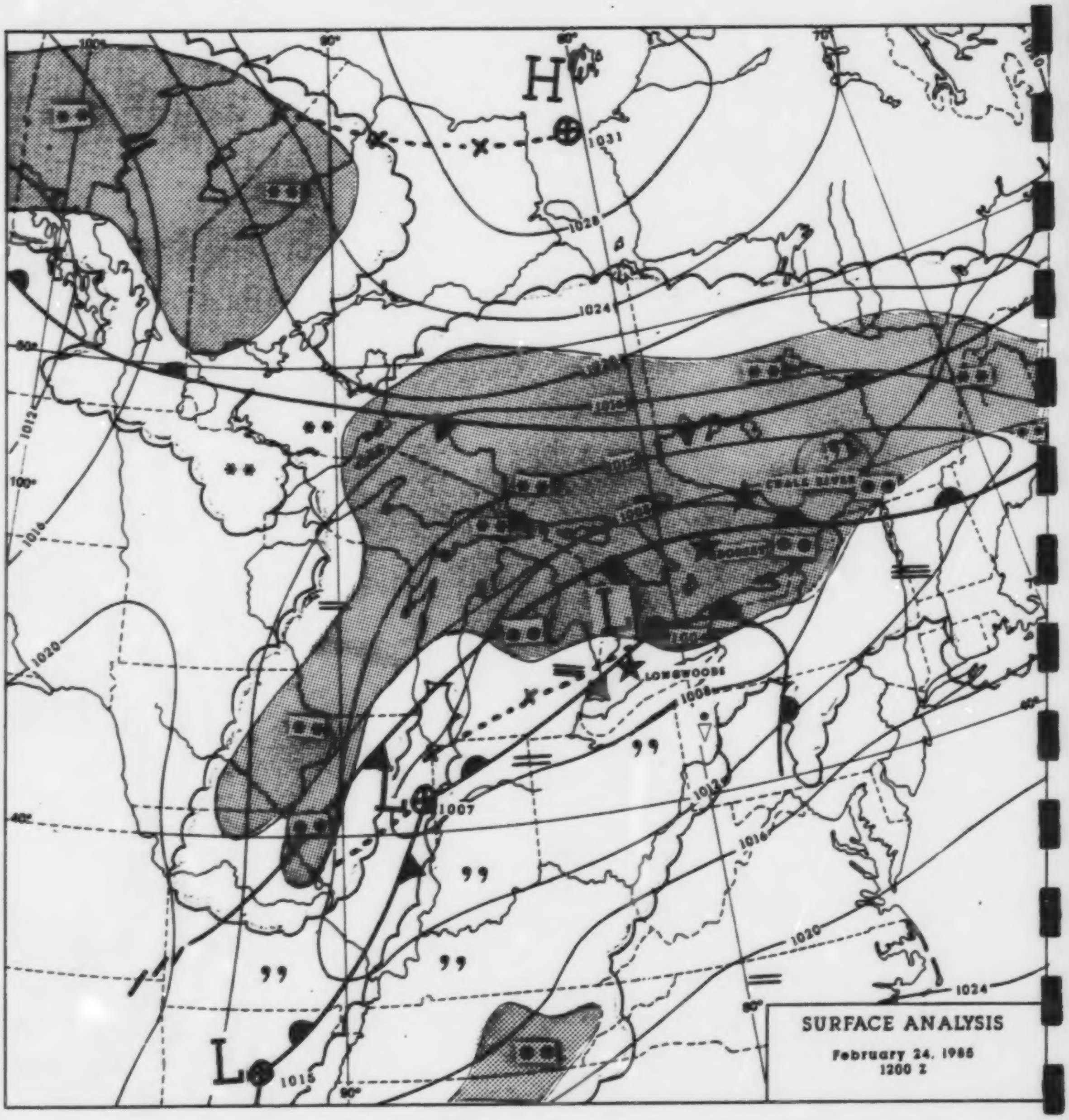

H
1031
1028
1024
1020
1016
1012
1008
1004
1007
1015
L
LONGWOODS
CHALK RIVER
DORSET
100°
90°
80°
70°
50°
40°
SURFACE ANALYSIS
February 24, 1986
1200 Z

FIGURE 1.3.2

London A

Feb. 23-24, 1985

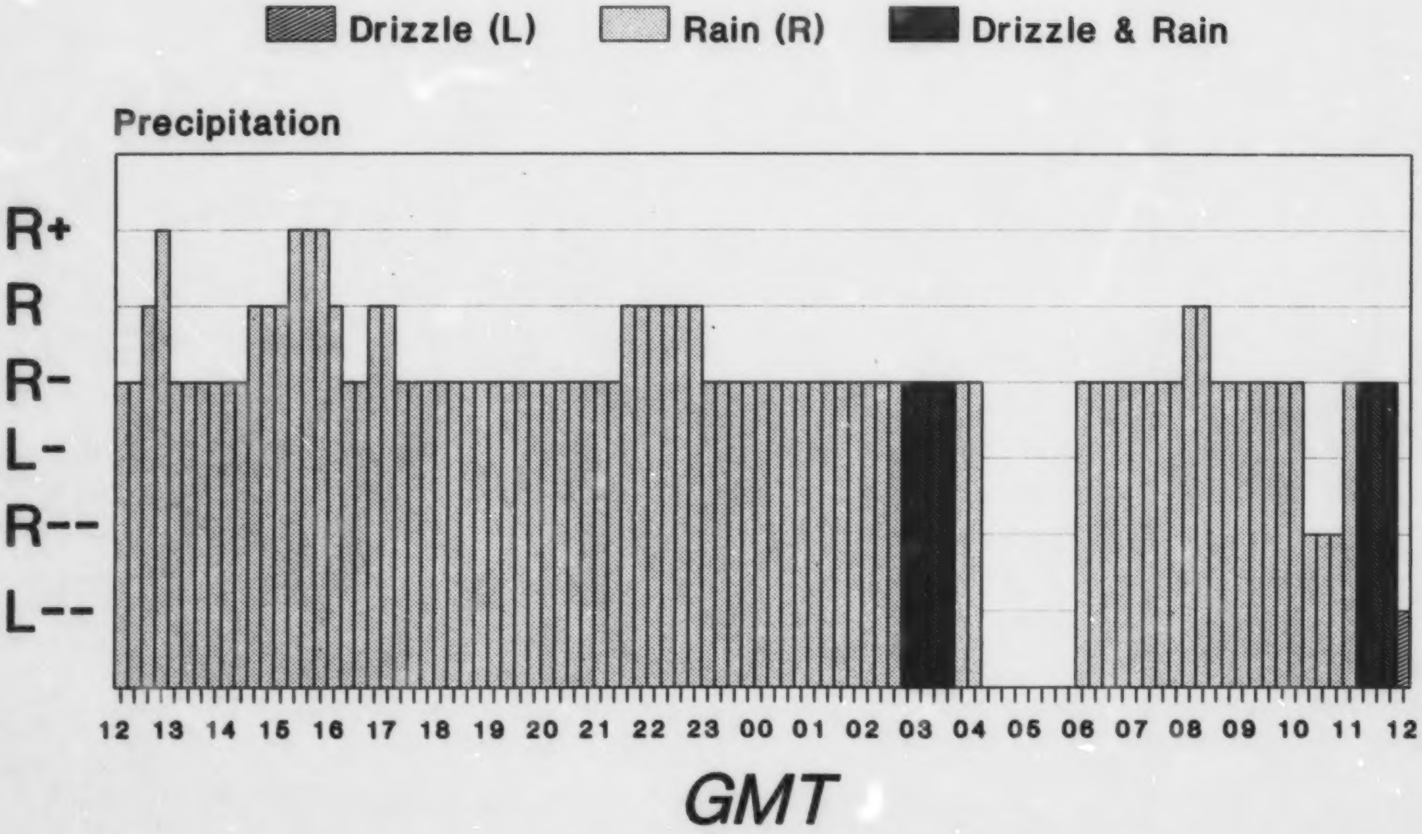


FIGURE 1.3.3

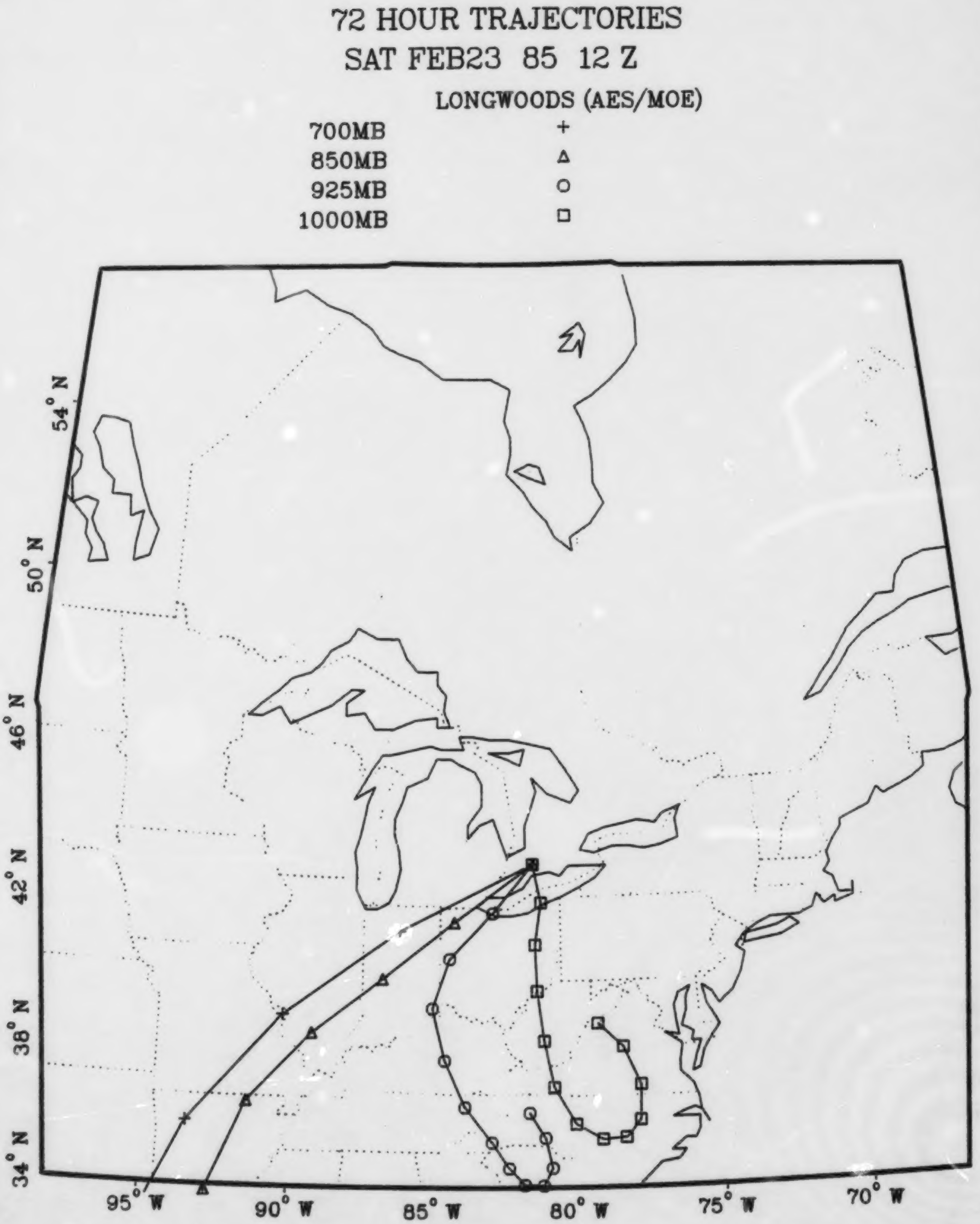

72 HOUR TRAJECTORIES
SAT FEB23 85 12 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.3.4

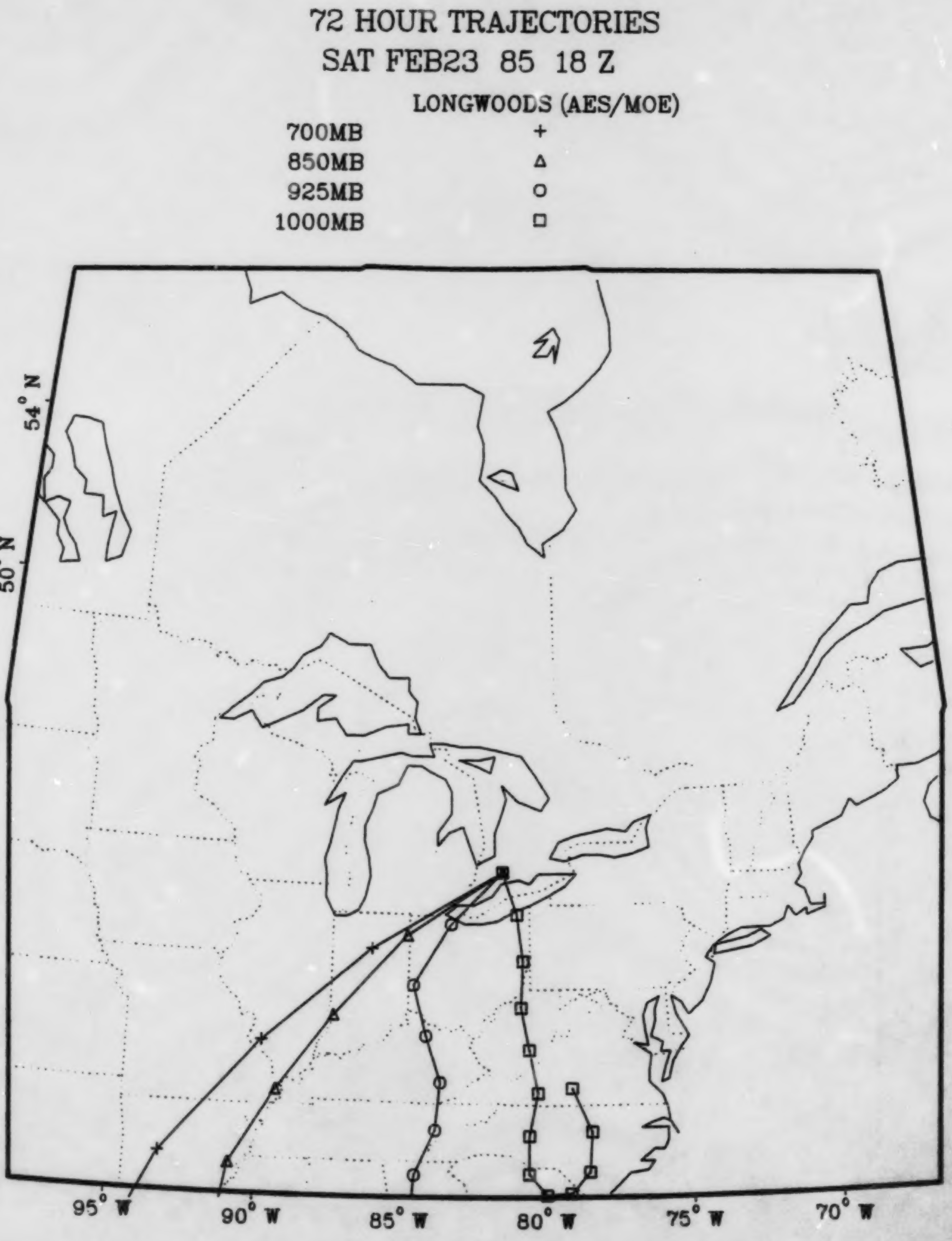

72 HOUR TRAJECTORIES
SAT FEB23 85 18 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.3.5

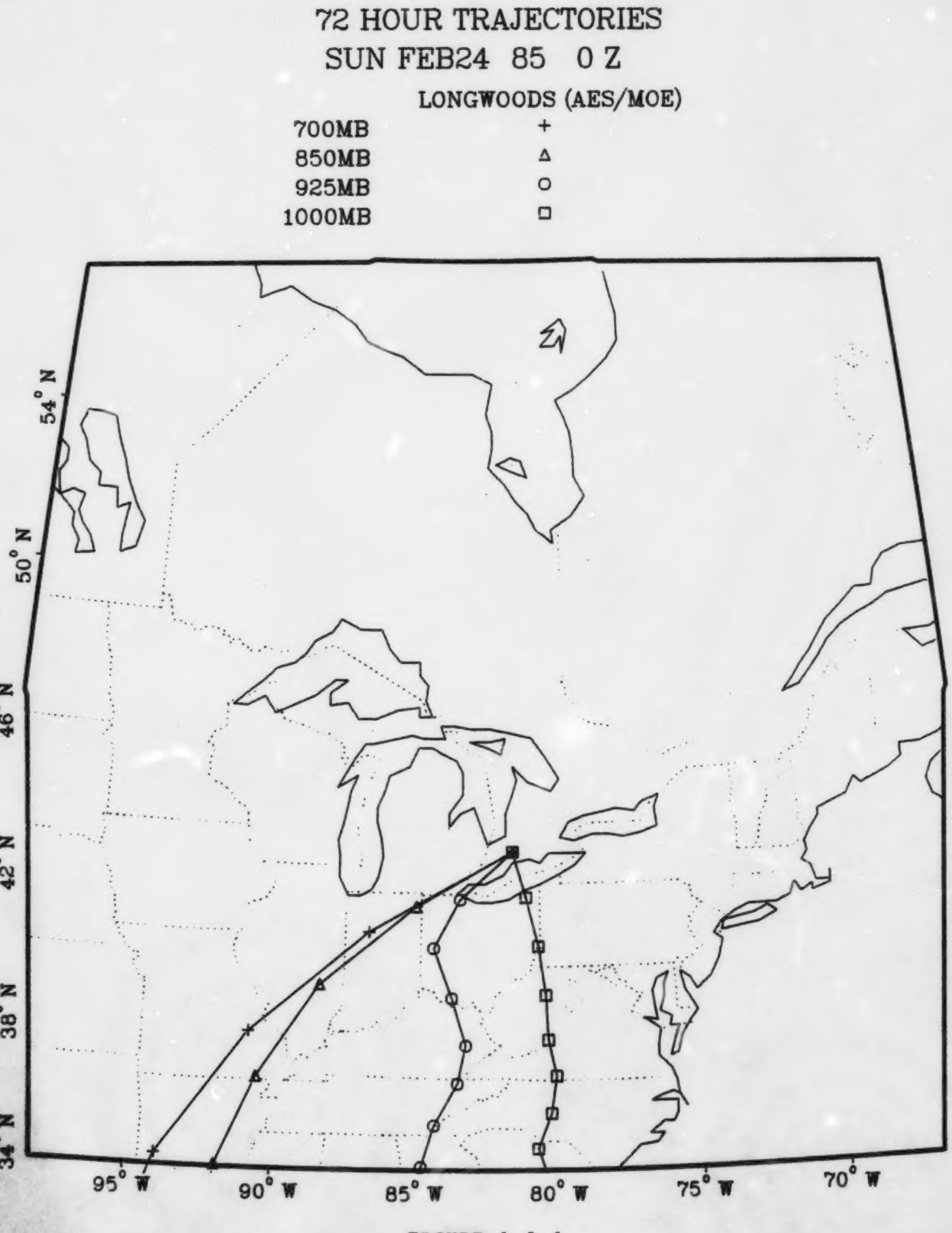

72 HOUR TRAJECTORIES
SUN FEB24 85 0 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.3.6

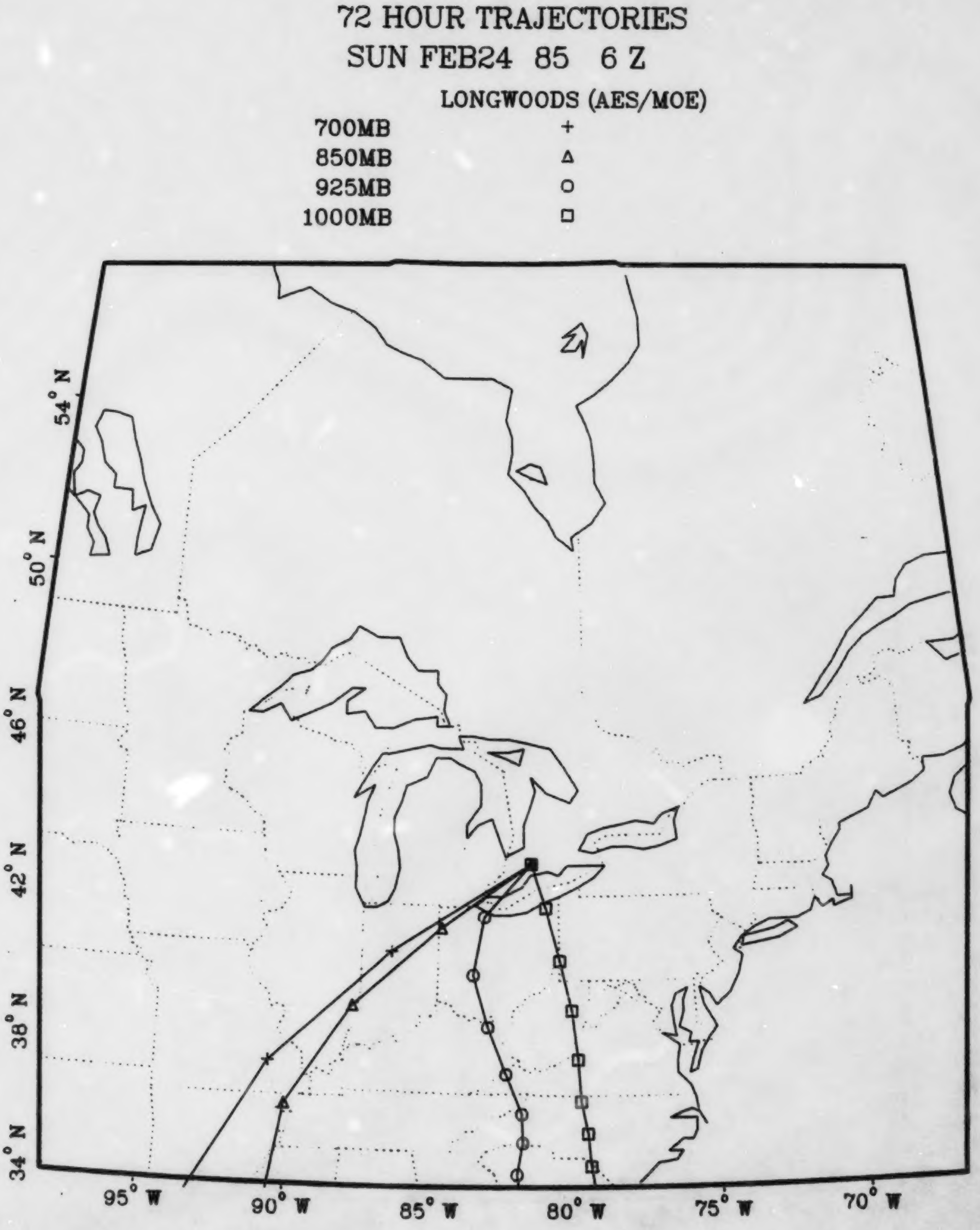

72 HOUR TRAJECTORIES
SUN FEB24 85 6 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.3.7

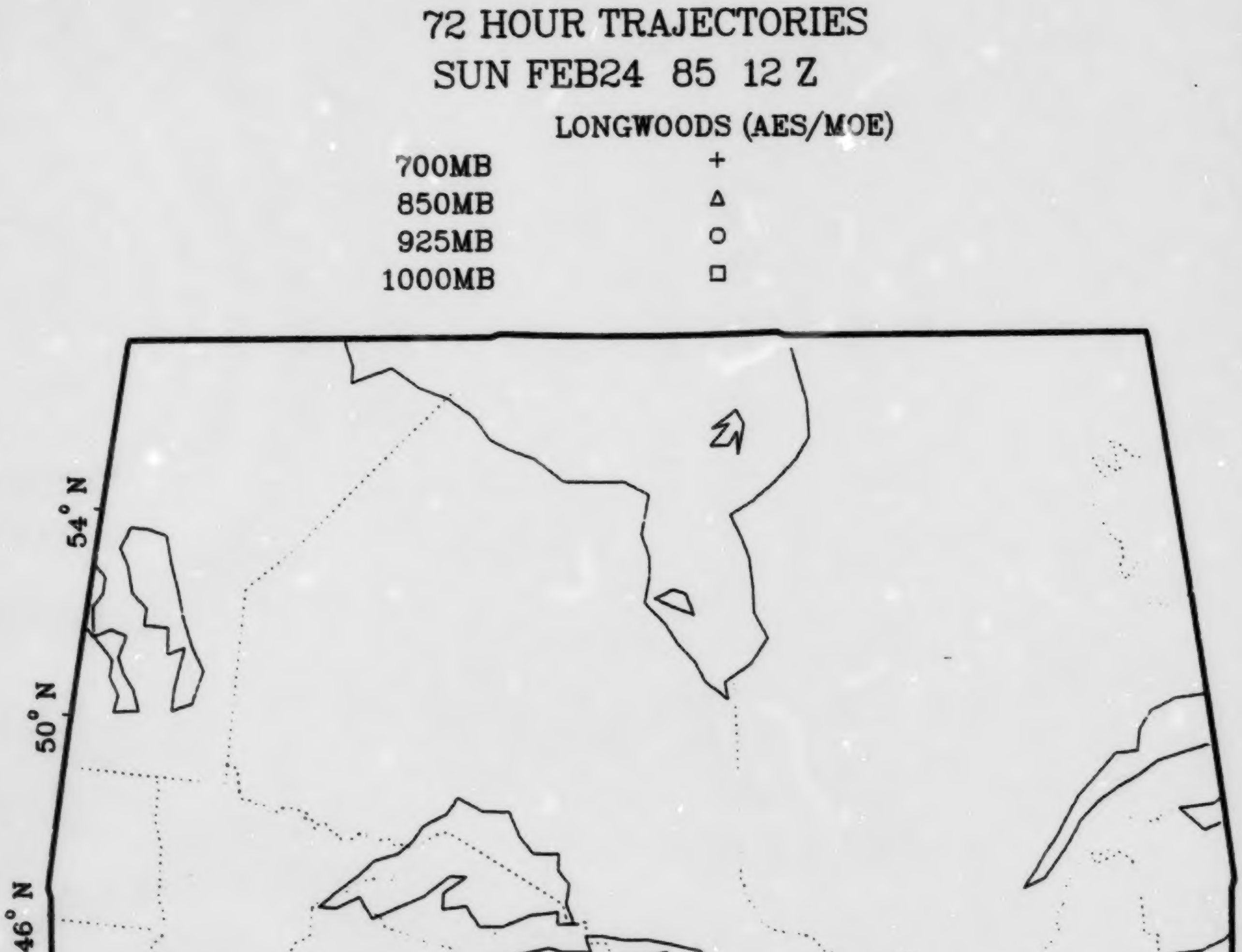

72 HOUR TRAJECTORIES
SUN FEB24 85 12 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.3.8

1.4 February 26-27, 1985. Longwoods

This episode was ranked 8th (8/10) for only NO_3^- top 25% wet deposition episodes at Longwoods(MOE).
A low pressure centre of 1009 mb over Lake Superior with a frontal system and an associated large area of continuous precipitation and a wave over northern Wisconsin with another frontal system were analyzed on Feb. 26, at 12Z, as shown in Fig. 1.4.1. The low and the wave moved approximately eastward and on Feb. 27, at 12Z the low had moved over Quebec, just east of Val d'Or as shown in Fig. 1.4.2, and deepened to 1005 mb. As shown in the figure, the wave was over New York just near the border with Vermont. As these systems moved, firstly the warm front associated with the wave passed over the station but yielded no precipitation. However, as the cold front associated with the wave first approached Longwoods, very light(R--) & light(R-) rain continuously occurred and the rain changed to snow, as exhibited in Fig. 1.4.3, with the approach of the second cold front.
The 72hr backward trajectories for 1000 mb, 925 mb, 850 mb and 700 mb levels at Longwoods for Feb. 26, 12Z, 18Z and Feb. 27, 00Z, 06Z and 12Z are illustrated in Figures 1.4.4, 1.4.5, 1.4.6, 1.4.7 and 1.4.8 respectively.
Air parcel arriving Longwoods at the 1000 mb level on Feb. 26, at 12Z travelled in a curved path passing through Tennessee, Kentucky, Indiana, high emission area in Ohio, Pennsylvania-Ohio border area and southern Ontario as exhibited in Fig. 1.4.4. The air trajectories at this level changed during the episode as shown in Figures 1.4.5-8, but did not pass over any highest emission area.
Air parcel arriving at 925 mb level on Feb. 26, at 12Z as shown in Fig. 1.4.4 travelled in a curved path crossing over Michigan, Wisconsin, highest NO_x emission area in Chicago, Illinois, Indiana, high emission area in Ohio and southern Ontario. The trajectory backed till Feb. 27, 00Z (see Figures 1.4.5-6) and then changed its path as shown in Figures 1.4.7-8. On Feb. 27, 12Z, it crossed over Missouri, Iowa, Minnesota, Wisconsin, Michigan and southern Ontario.
The air trajectories at 850 mb level show (Figures 1.4.4-8) that NO_x from high emission Detroit could have been transported to arrive on Feb 26, 12-18Z, and from the highest emission Chicago area in Illinois on Feb 27, 00-06Z.
The air trajectories at 700 mb level show (see Figures 1.4.4-8) that pollutant (NO_x) from high emission areas on Missouri-Illinois border and Detroit in Michigan (Figures 1.4.4-5) and from the highest emission Chicago area(Figures 1.4.7) could have been transported during this event.
In summary, passage of cold fronts gave rain and snow for about nine hours and NO_x from the highest emission Chicago area at 925, 850 & 700 mb level and from other high emission areas at all levels could have been transported during this event.

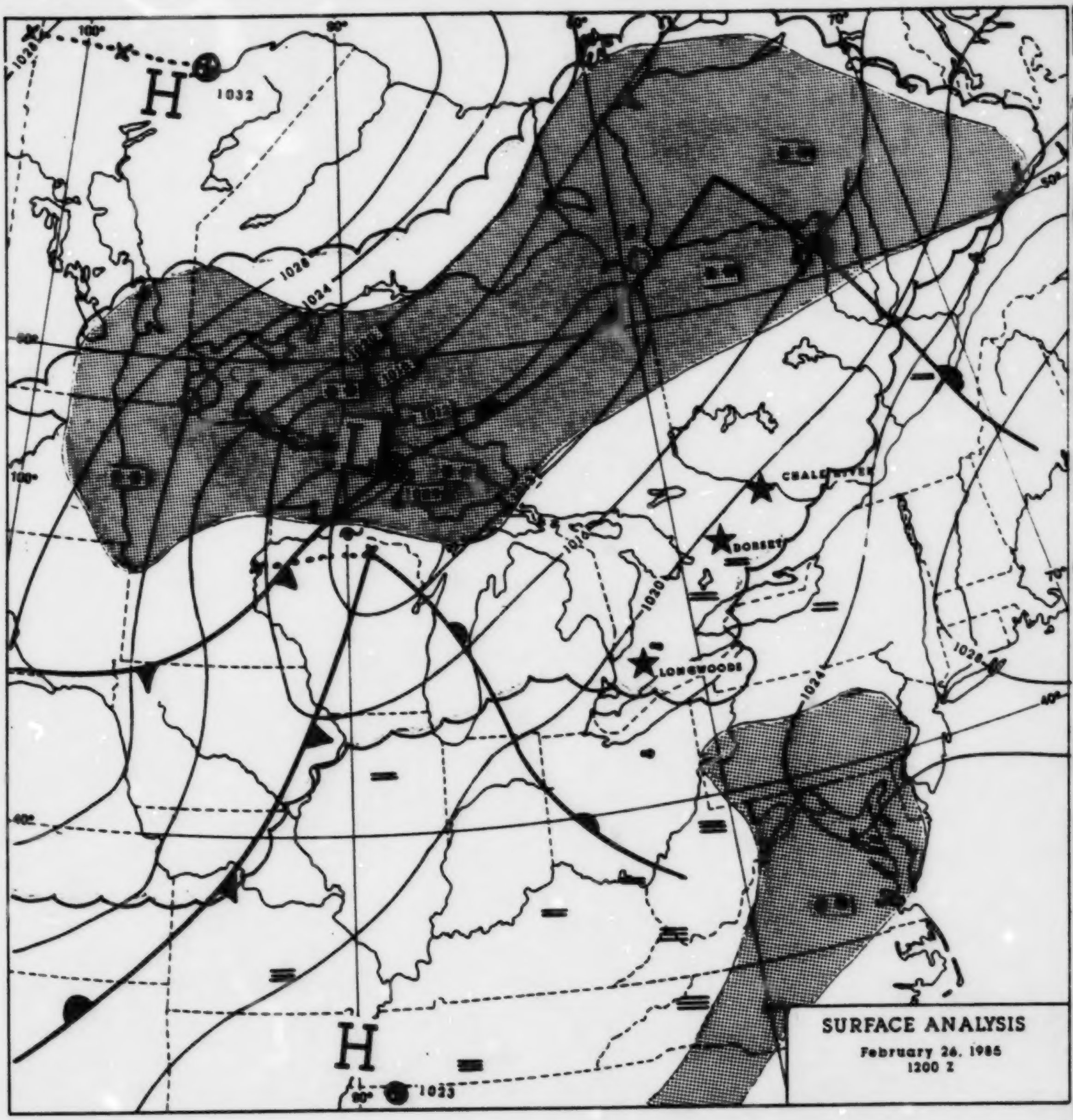
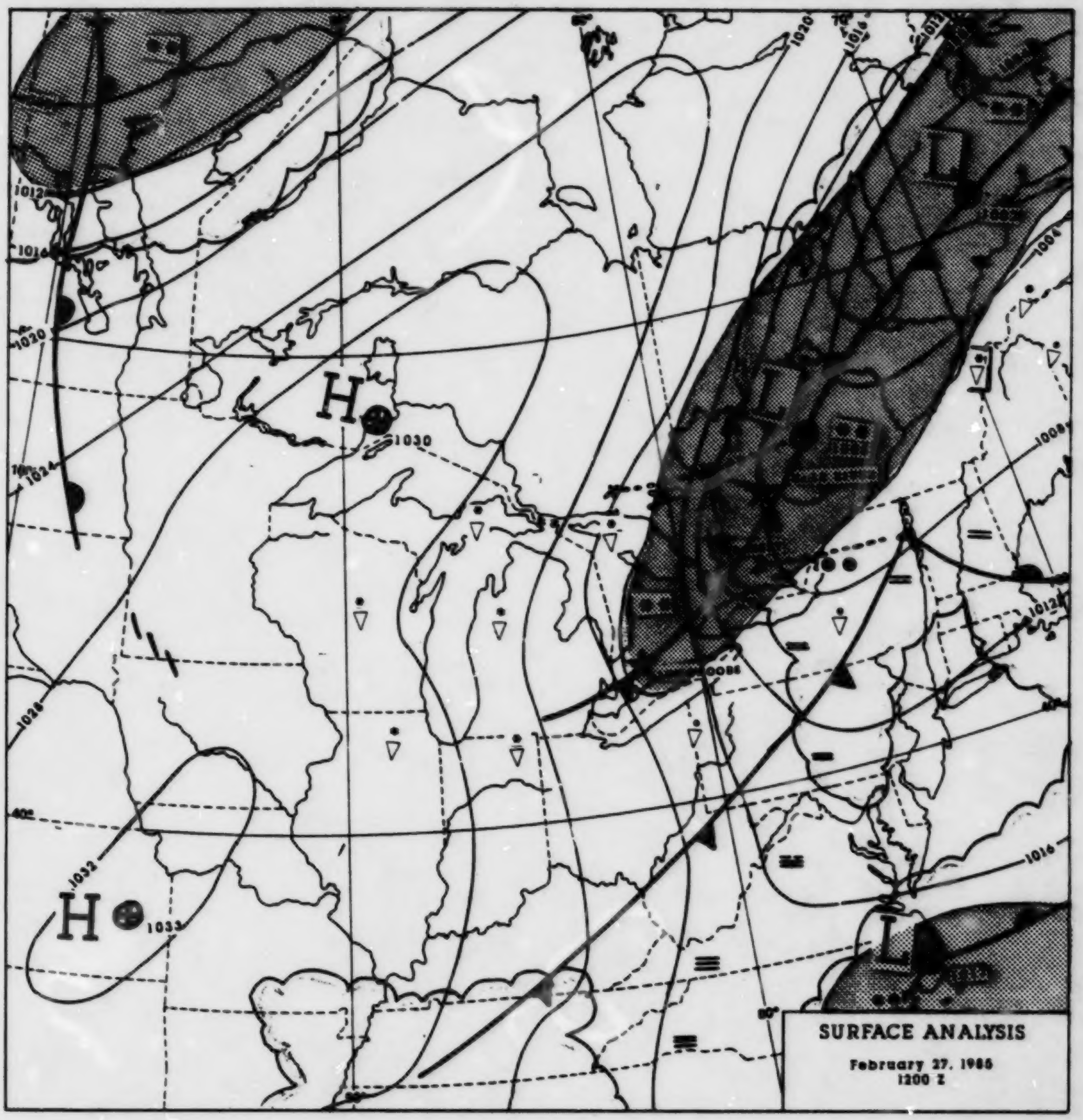

SURFACE ANALYSIS
February 26, 1985
1200 Z
H
1032
H
1033
L
CHALK RIVER
DORSET
LONGWOODS
1028
1024
1020
1016
1028
1024
100°
90°
80°
70°
50°
40°

FIGURE 1.4.1


H
1030
H
1033
1032
L
L
L
L
1012
1016
1020
1024
1028
1004
1008
1012
1016
1020
1016
1012
40°
80°

SURFACE ANALYSIS

February 27, 1985
1200 Z

FIGURE 1.4.2

London A

Feb. 26-27, 1985

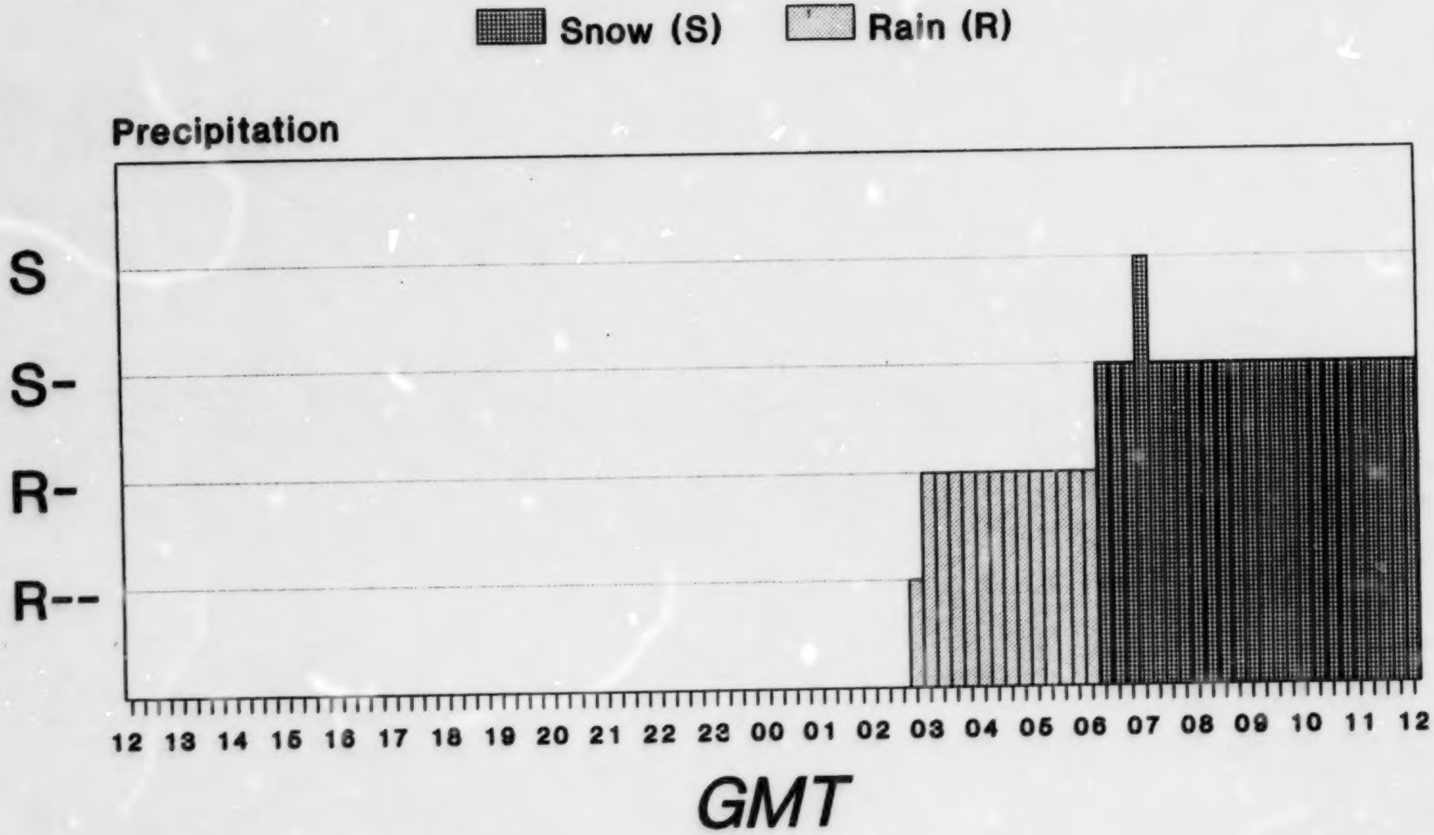


FIGURE 1.4.3

72 HOUR TRAJECTORIES
TUE FEB26 85 12 Z

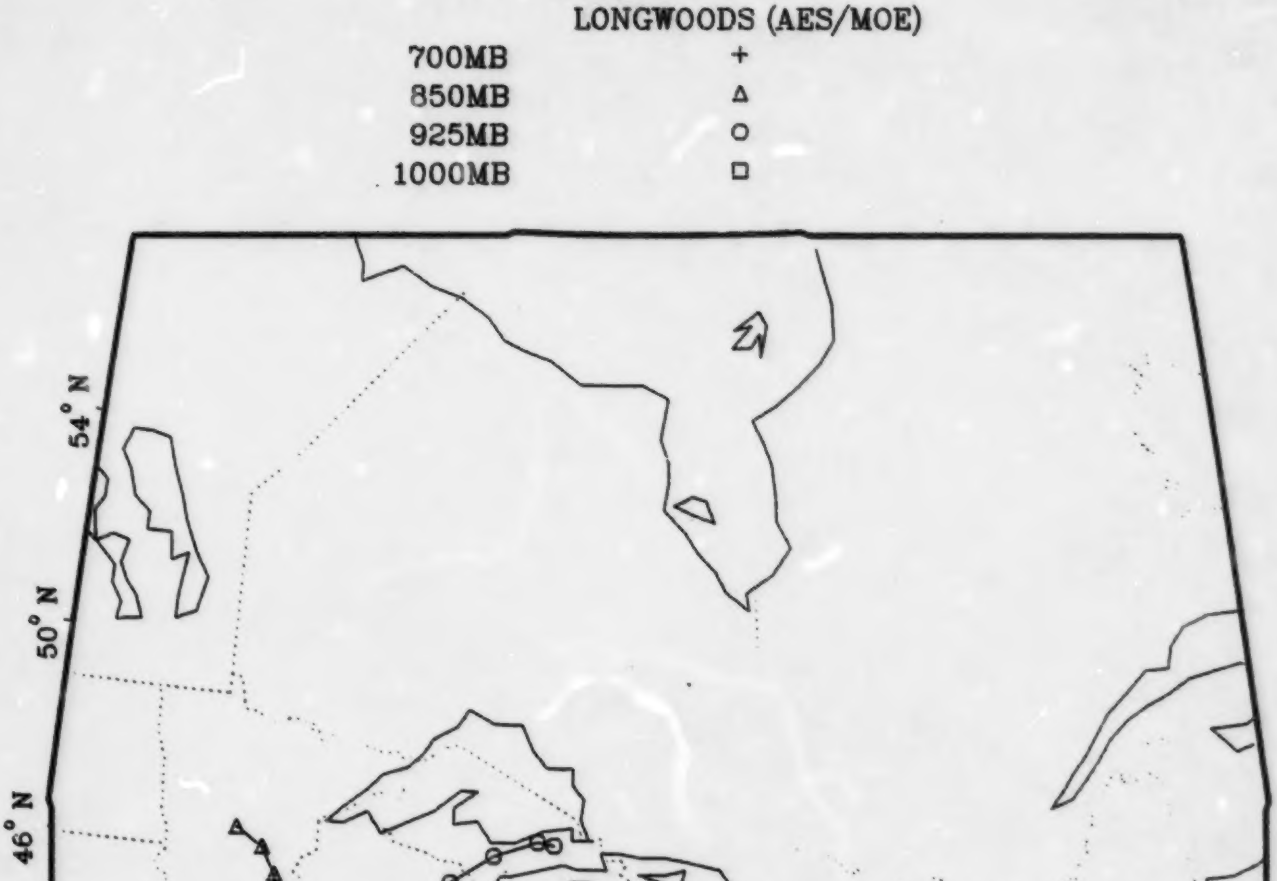

LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.4.4

72 HOUR TRAJECTORIES
TUE FEB26 85 18 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	Δ
925MB	○
1000MB	□

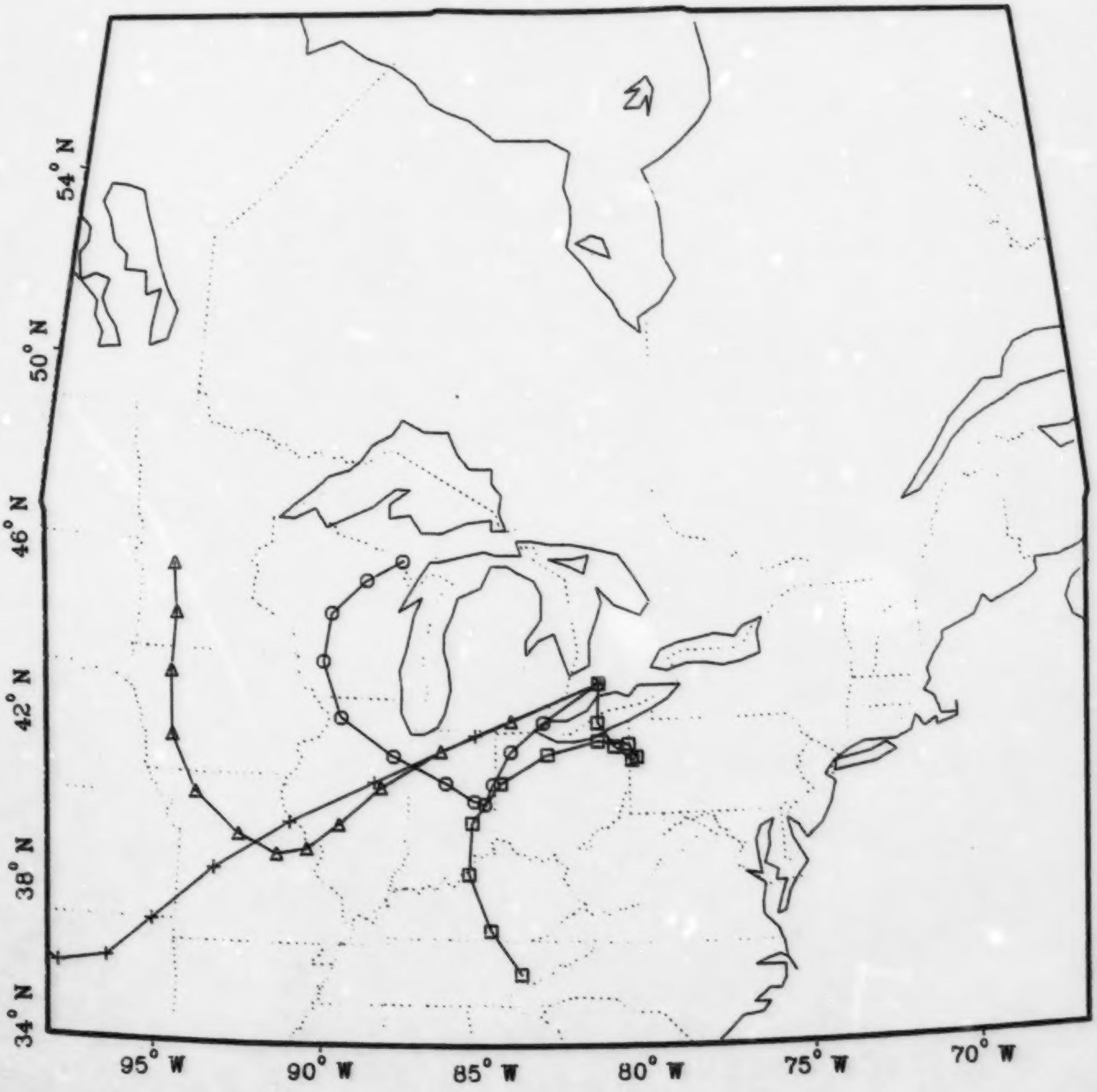

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.4.5

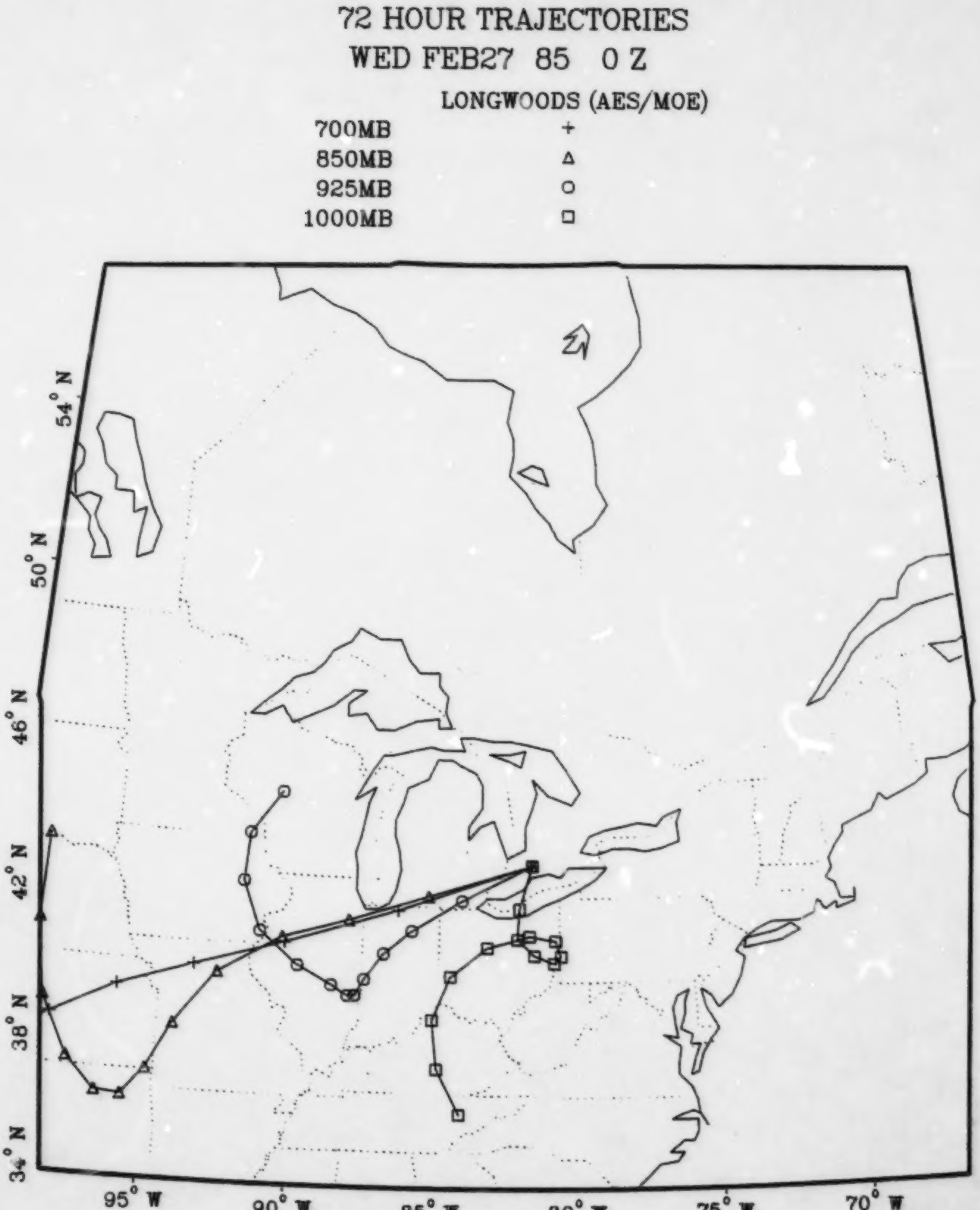

72 HOUR TRAJECTORIES
WED FEB27 85 0 Z
LONGWOODS (AES/MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.4.6

72 HOUR TRAJECTORIES
WED FEB27 85 6 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	Δ
925MB	○
1000MB	□

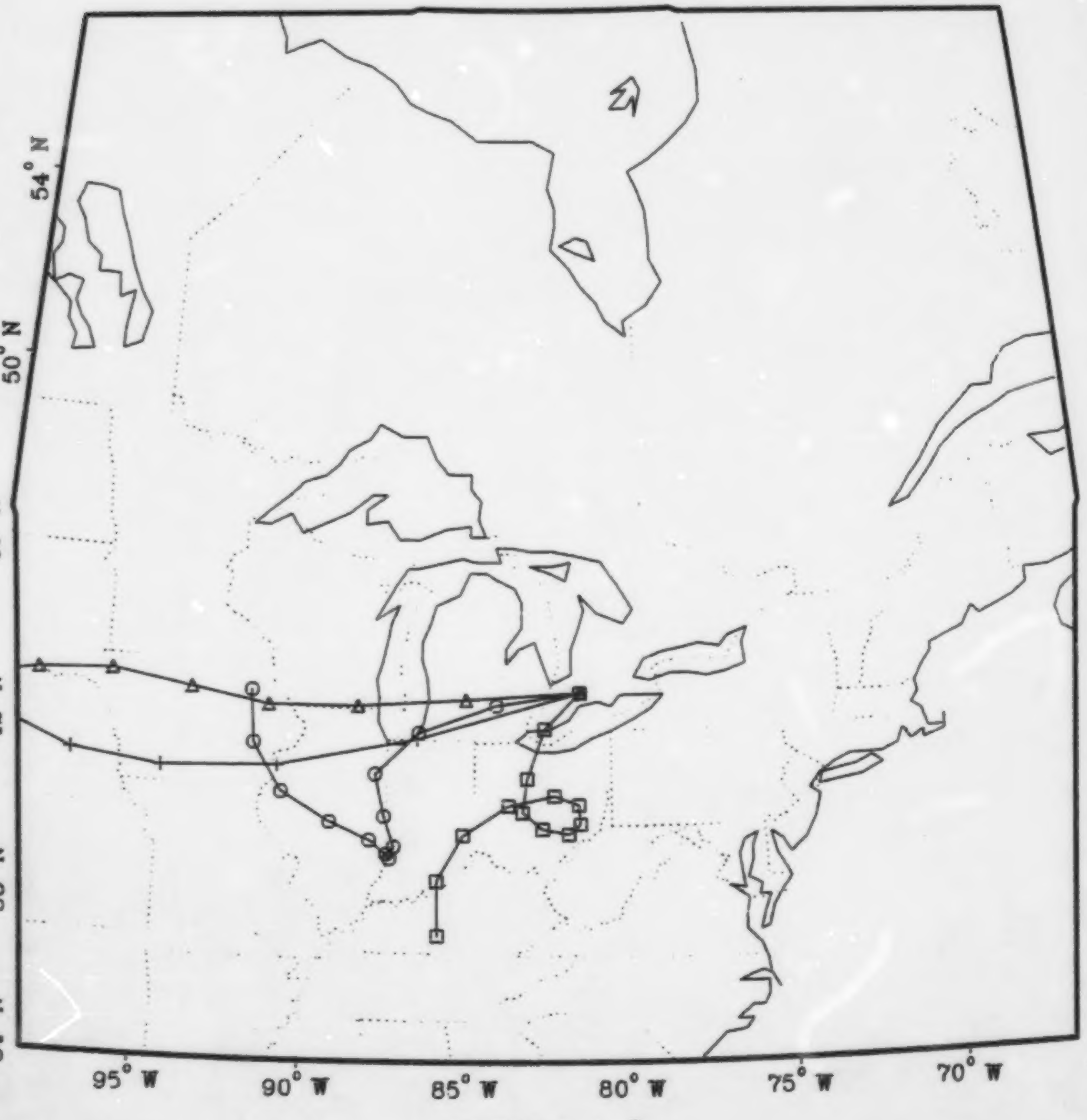

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.4. 7

72 HOUR TRAJECTORIES
WED FEB27 85 12 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

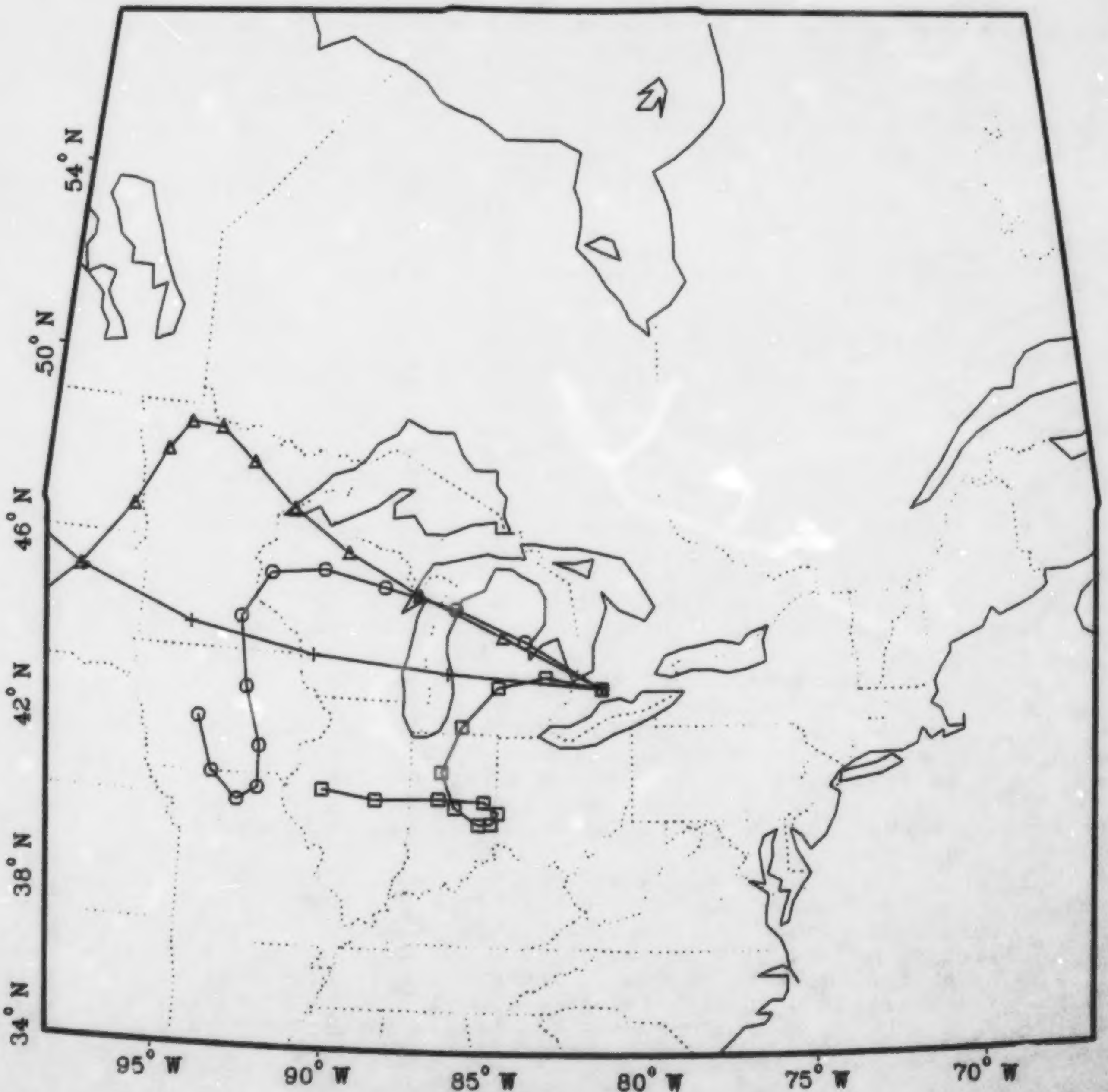

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.4.8

1.5 March 4-5, 1985, Longwoods & Dorset

This is an event recorded at two stations. At Longwoods(AES), it ranked 3rd for $SO_4^=$ (3/8) and 6th (6/10) for NO_3^- deposition episodes and at Longwoods(MOE) it was 6th (6/8) for $SO_4^=$ deposition only and was not included in the top 25% events for NO_3^-. At Dorset, it ranked 7th (7/12) for NO_3^-.

Separate narratives for Longwoods and Dorset are as follows:

Longwoods:

On March 4, at 12Z, A large cyclone influenced southern Ontario as shown in Fig. 1.5.1. A low pressure centre of 987mb near Mason City, Iowa and another low, 988 mb, associated with frontal system and a very large area of continuous precipitation, snow, freezing rain and rain, affected Longwoods. As this system moved in ENE direction the cold and warm fronts passed over the station and on March 5, at 12Z, the continuous precipitation had crossed over Longwoods as illustrated in Fig. 1.5.2 with the wave near Dorset. As the warm front approached Longwoods, snow changed to ice pellets and freezing rain as shown in Fig. 1.5.3A, and with the warm frontal passage at about 00Z on March 5, precipitation changed to rain. Dry condition prevailed in the warm sector and with cold front passage around 06Z snow showers with light(SW-) and very light(SW--) intensity occurred after 09Z.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for March 4, at 12Z, 18Z and March 5, at 00Z, 06Z and 12Z are shown in Figures 1.5.4, 1.5.5, 1.5.6, 1.5.7 and 1.5.8 respectively.

Air parcels arriving at 1000 mb on March 4, at 12Z& 18Z passed through polluted Toronto area (see Fig. 1.5.4-5). On March 5, at 00Z SO_2 from the highest emission area in Lake Abitibi-Noranda Mines region could have been transported as shown in Fig. 1.5.6. Also, transport from the highest emission area in Sudbury was quite likely (see Fig. 1.5.7-8). NO_x from high emission Pennsylvania-New Jersey-Maryland area and Ohio could also have been transported as indicated in Figures 1.5.7-8.

Air trajectories at 925 mb levels indicate, as shown in Figures 1.5.4-8, that SO_2 from the highest emission Sudbury, Pennsylvania-Virginia, and Chicago area and NO_x from Chicago area could have been transported. Transportation from high, medium and low emission areas in several states was possible.

Air trajectories at 850 mb level (see Figures 1.5.4-8) show that SO_2 from the highest emission Virginia-Ohio and Chicago area and NO_x from Chicago area could have been transported in addition from several high, medium and low emission area.

Air trajectories at 700 mb level show that SO_2 and NO_x from the highest emission Chicago area could have been transported (see Fig. 1.5.8)

In summary, warm front passage yielded snow, freezing rain and rain and cold front passage snow showers and the precipitation occurred for about 17 hours during this episode at Longwoods. Pollution(SO_2 & NO_x) transport at low levels(1000 mb & 925 mb) from Abitibi-Noranda, Sudbury, Pennsylvania-Virginia as well as Chicago area and at high levels(850 mb & 700 mb) from Virgina-Ohio and Chicago to Longwoods was likely during this episode.

(1.5 March 4-5, 1985, continued)

Dorset:

The storm which affected Longwoods also influenced the weather at Dorset. As shown in Fig. 1.5.1, on March 4, at 12Z snow fell and it appears that warm front remained south of Dorset. On March 5, at 12Z as exhibited in Fig. 1.5.2 the wave lied just SE of Dorset with Dorset still in the continuous precipitation area. As the warm front approached Dorset, snow at the nearest weather station Muskoka changed to ice pellets as shown in Fig. 1.5.3B. Likely no rain fell at Dorset as it did not exist in warm sector during the episode. Observations are not made at Muskoka during 03-11Z. Precipitation in the form of moderate snow(s), light snow(S-) and ice pellets(IP) occurred for most the hours in this event.
Air trajectories at 1000 mb level show that SO_2 from the highest emission Lake Abitibi-Noranda Mines could have been transported on March 4, at 12Z-18Z and March 5, 00Z (see Figures 1.5.9-11). No other emission area appears to be significant in pollution transport.
Air trajectories at 925 mb level also show (see Figures 1.5.9-11) that SO_2 from Lake Abitibi-Noranda Mines area could have been transported for some time during March 4, 12Z - March 5, 00Z. However, unlike 1000 mb level, transport for only a few hours on March 4 between 12Z and 18Z and between March 4, 18Z and March 5, 00Z would have occurred.
Air parcel arriving at 850 mb on March 4, at 12Z, did not carry any pollution as its path did not pass over any significant emission area, but at 18Z, it could have carried SO_2 from the highest emission Detroit and Virginia-Pennsylvania border area and NO_x from high emission Detroit, Ohio and Ohio-Virginia-Pennsylvania border area as shown in Fig. 1.5.10. Transport from these regions continued till March 5, 06Z as shown in Figures 1.5.11-12. On March 5, 12Z (see Fig. 1.5.13) no significant transport appears likely. It should also be mentioned that trajectory crossed over Sudbury area during 12Z-18Z on March 4 and could also have carried SO_2 from this source.
Air parcel arriving at 700 mb level on March 4, 12Z-18Z, as shown in Figures 1.5.9-10, show that NO_x from high emission Detroit area could have been transported. Transport from high emission Missouri-Illinois border area at March 5, 00Z-06Z(see Figures 1.5.11-12) and from the highest emission Chicago area at 12Z, as shown in Fig. 1.5.13, would also have been made.
In summary a frontal system, although did not pass over the station but its close proximity yielded snow and ice pellets for most of the period and transport of NO_x at high levels(850 mb & 700 mb) from a number of different sources could have been made. Low level (1000 mb & 925 mb) transport of SO_2 for a few hours was also likely.

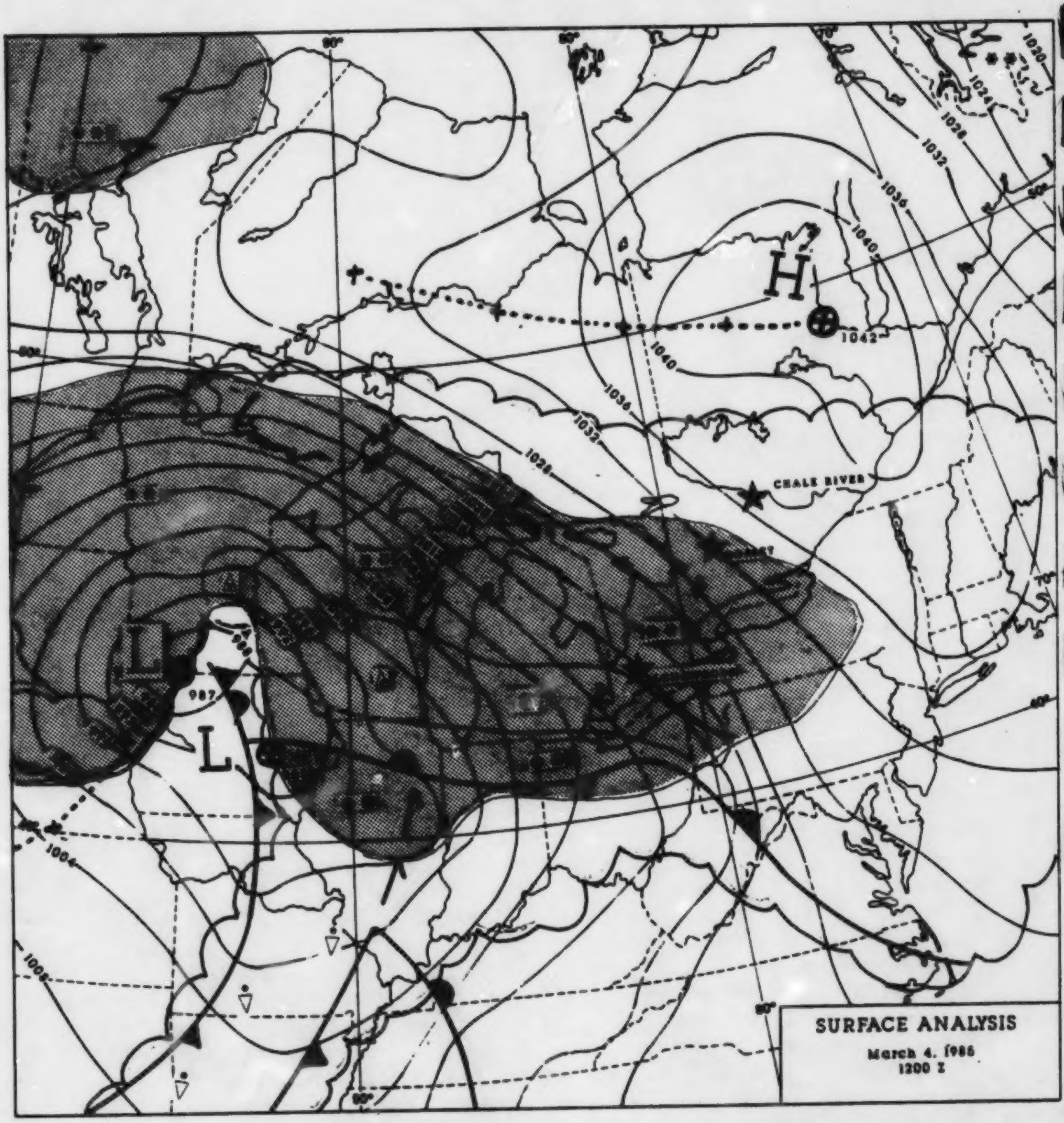

1020
1024
1028
1032
1036
1040
H
1042
1040
1036
1032
1028
CHALK RIVER
L
987
L
1004
1008
SURFACE ANALYSIS
March 4, 1985
1200 Z

FIGURE 1.5.1

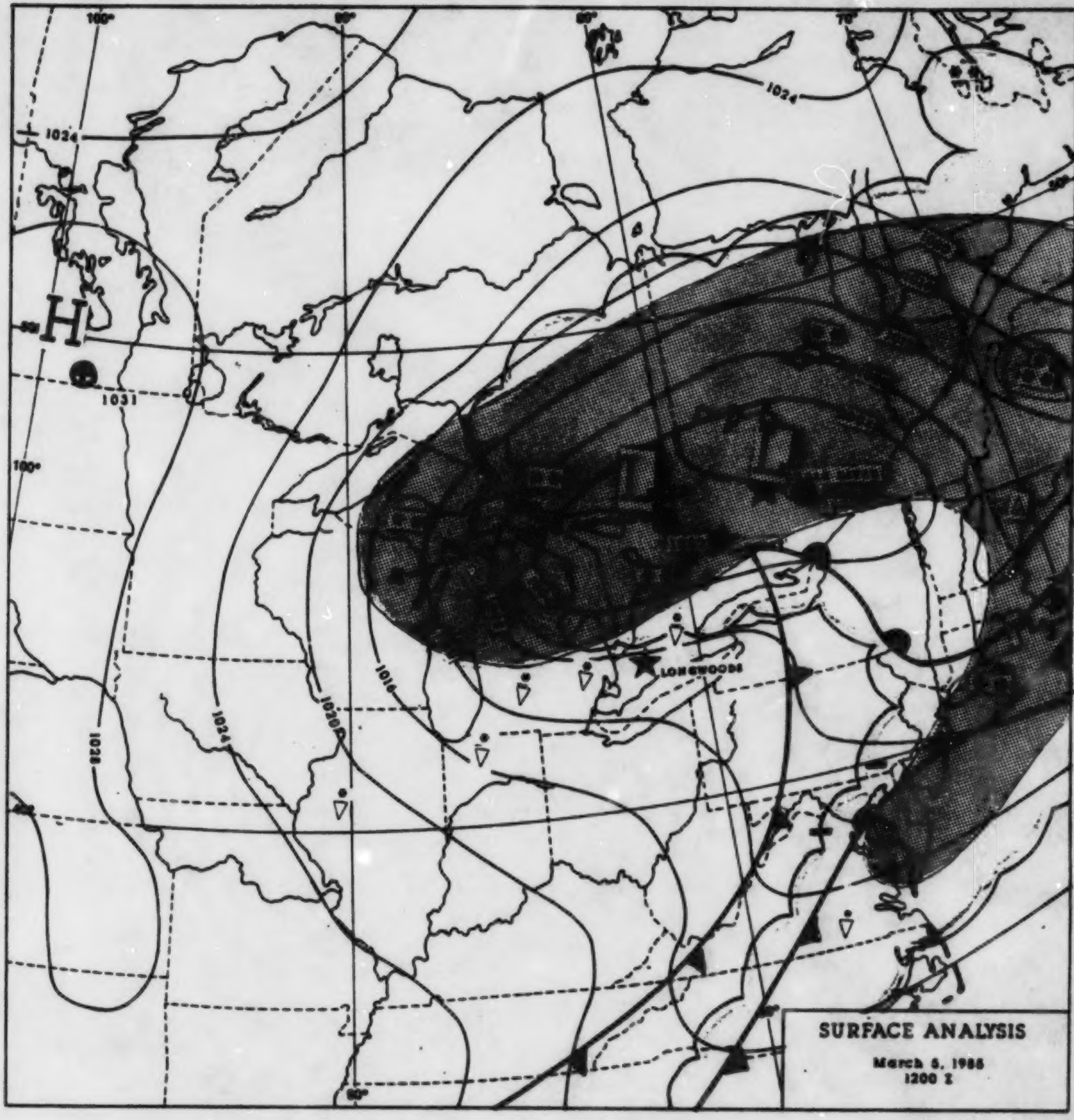
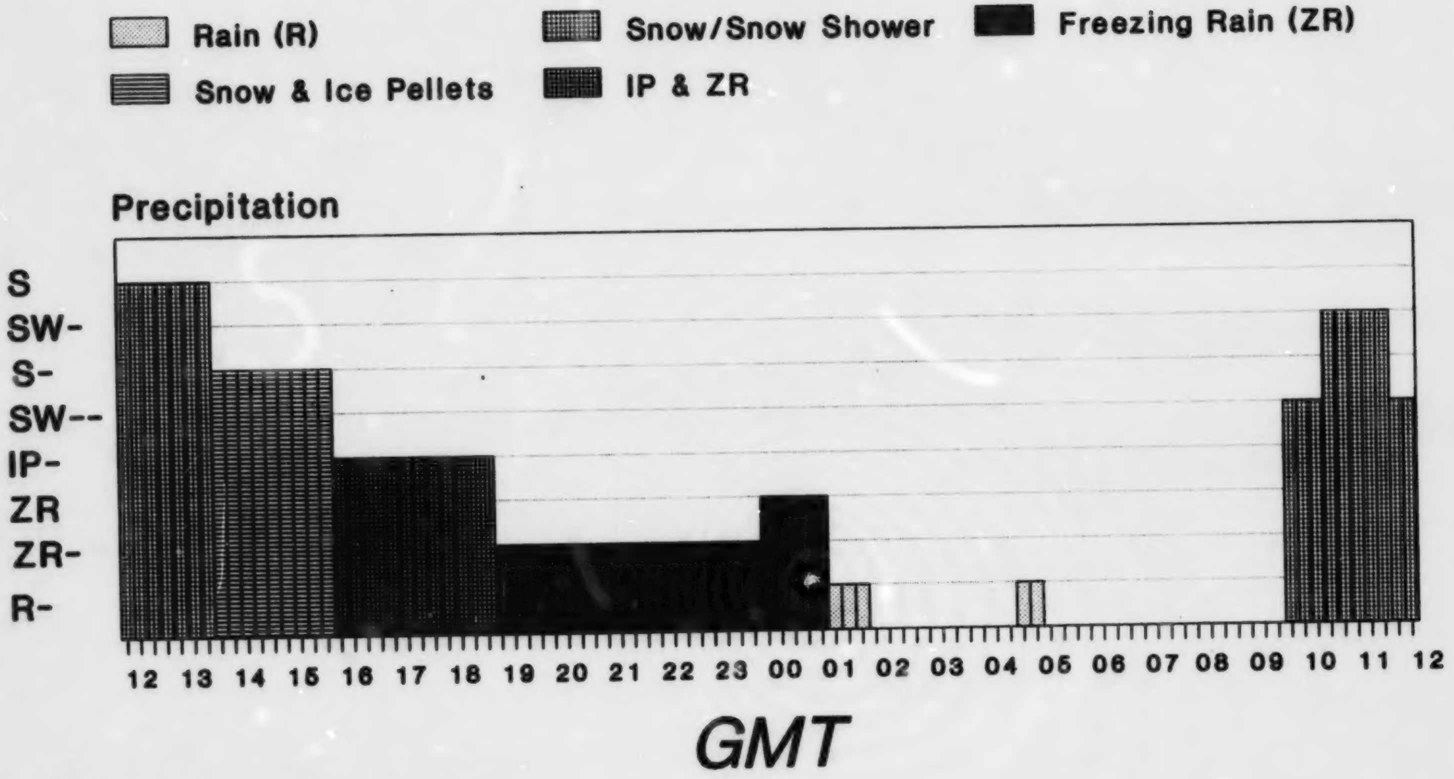

100°
90°
80°
70°
1024
1024
H
1031
100°
1028
1024
1020
1016
L
L
LONGWOODS
90°
SURFACE ANALYSIS
March 5, 1986
1200 Z

FIGURE 1.5.2

London A
Mar. 4-5, 1985



S - Snow, SW - Snow Showers
IP - Ice Pellets

FIGURE 1.5.3A

Muskoka A

Mar. 4-5, 1985

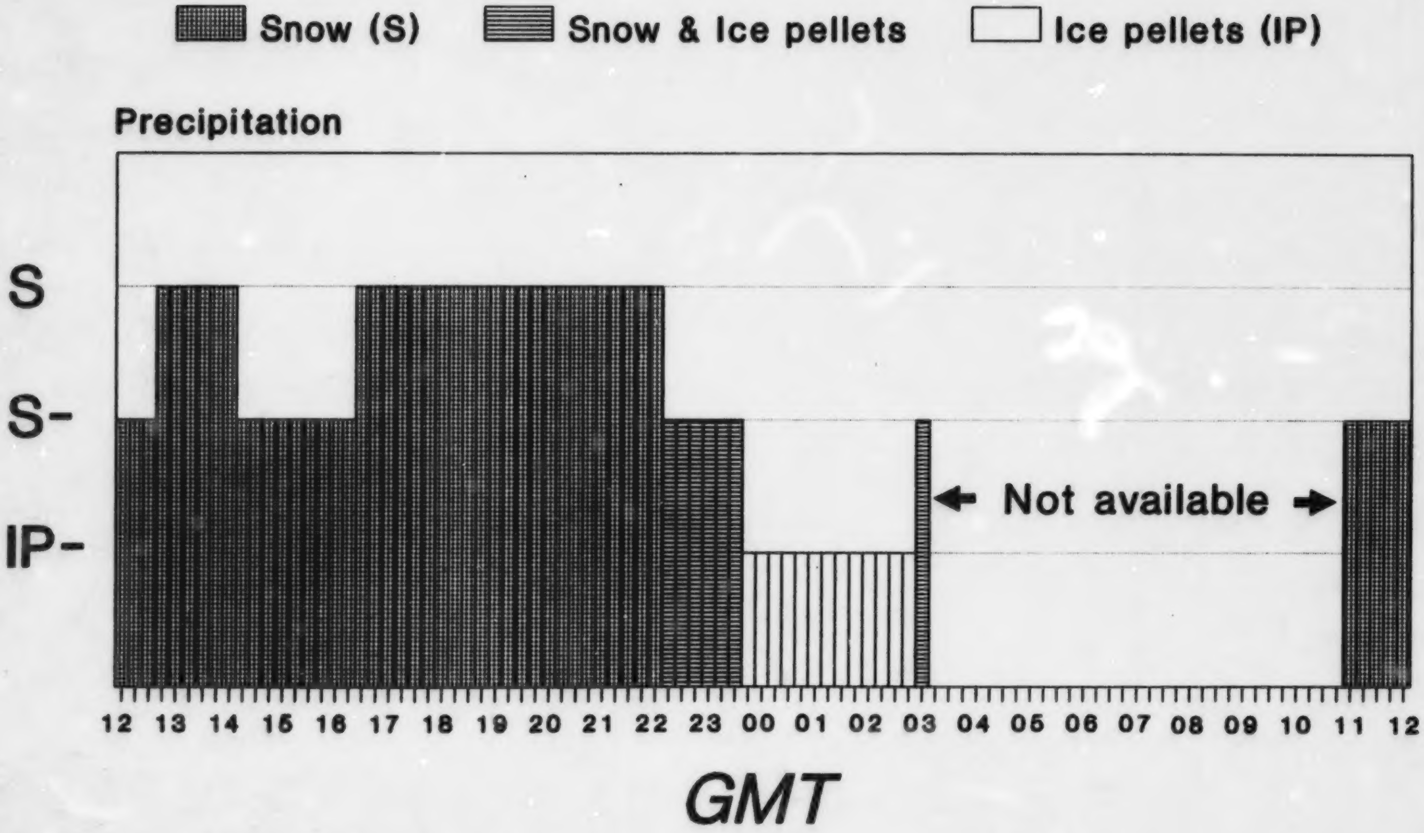


FIGURE 1.5.3B

72 HOUR TRAJECTORIES
MON MAR 4 85 12 Z
LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

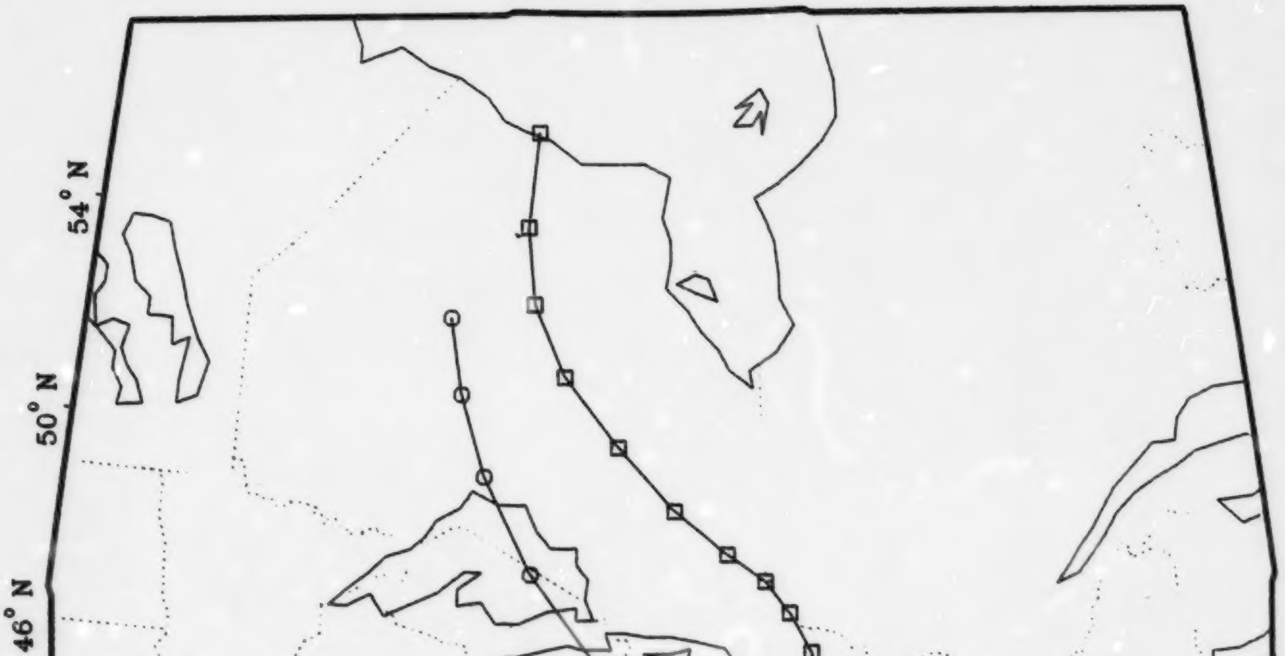

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.4

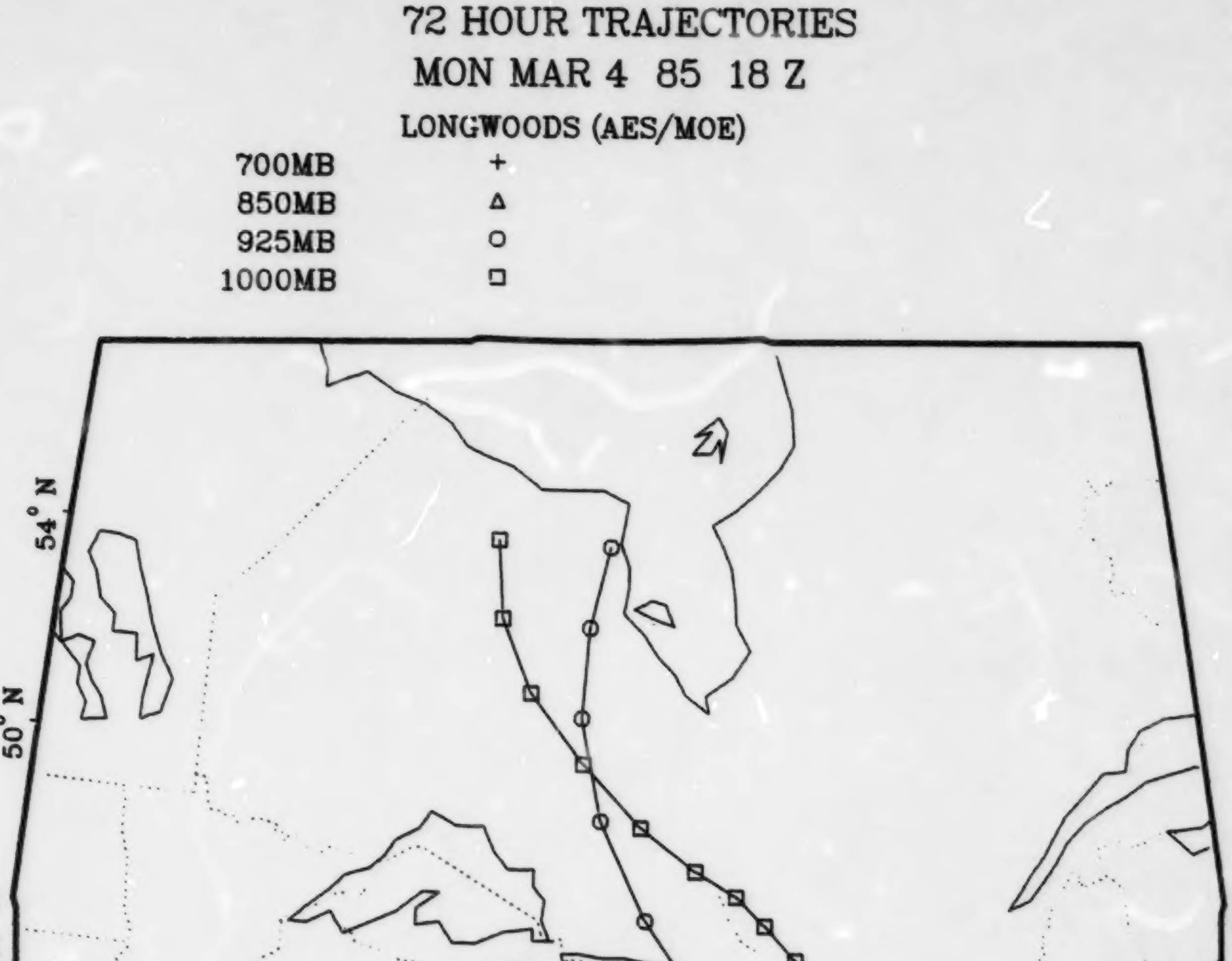

72 HOUR TRAJECTORIES
MON MAR 4 85 18 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.5

72 HOUR TRAJECTORIES
TUE MAR 5 85 0 Z
LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

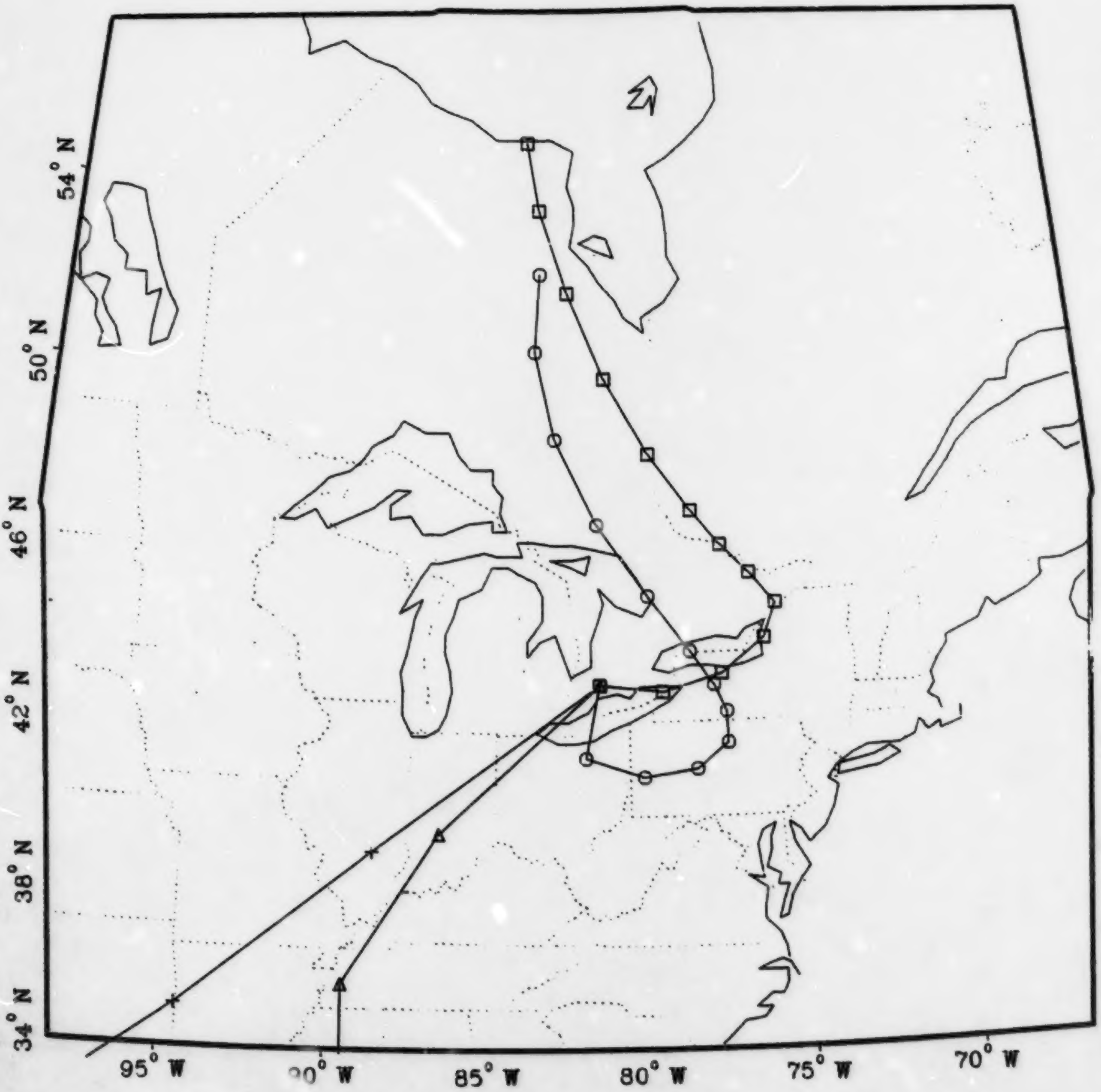

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.6

72 HOUR TRAJECTORIES
TUE MAR 5 85 6 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

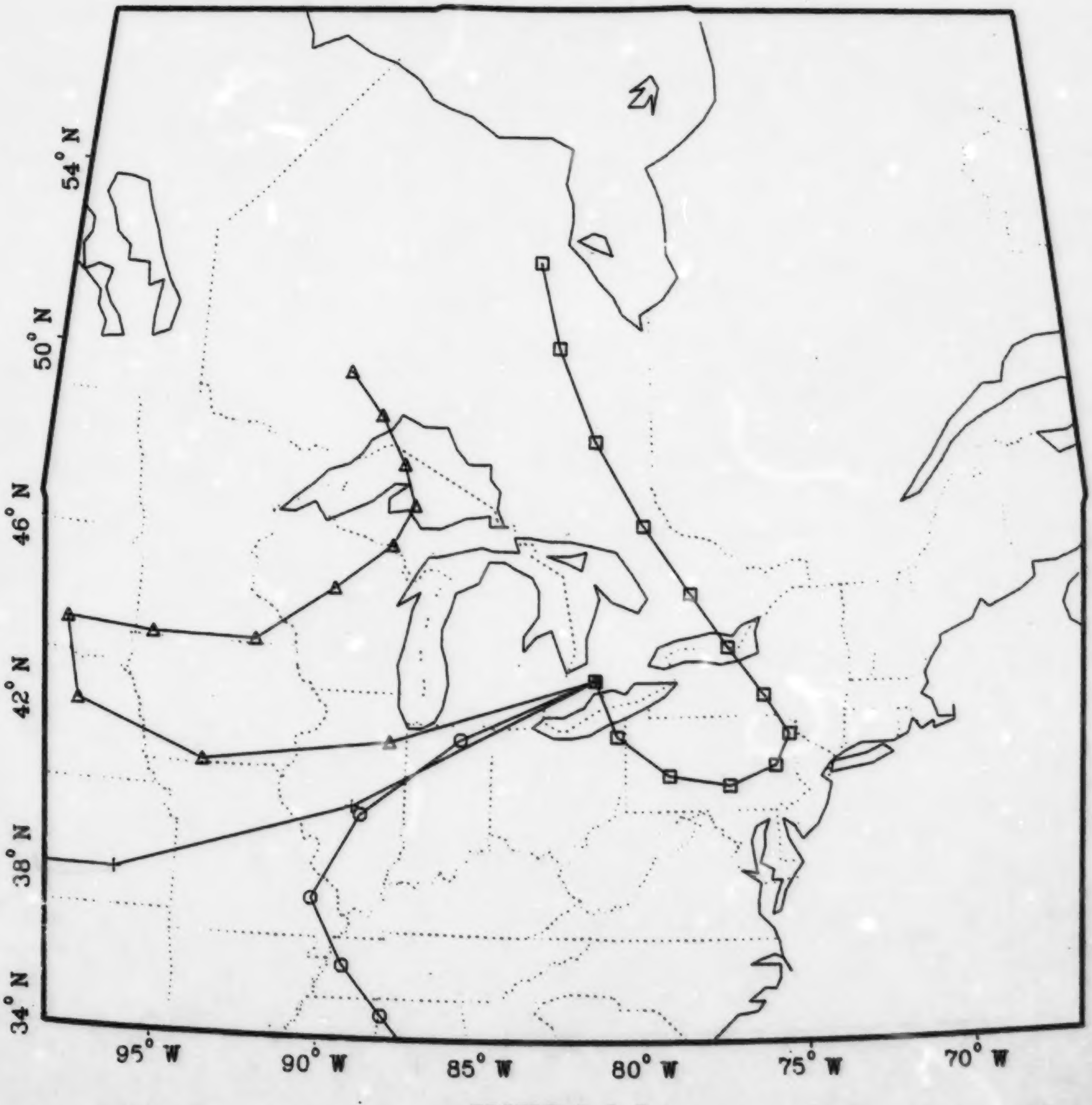

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.7

72 HOUR TRAJECTORIES
TUE MAR 5 85 12 Z
LONGWOODS (AES/MOE)

700MB +
850MB △
925MB ○
1000MB □

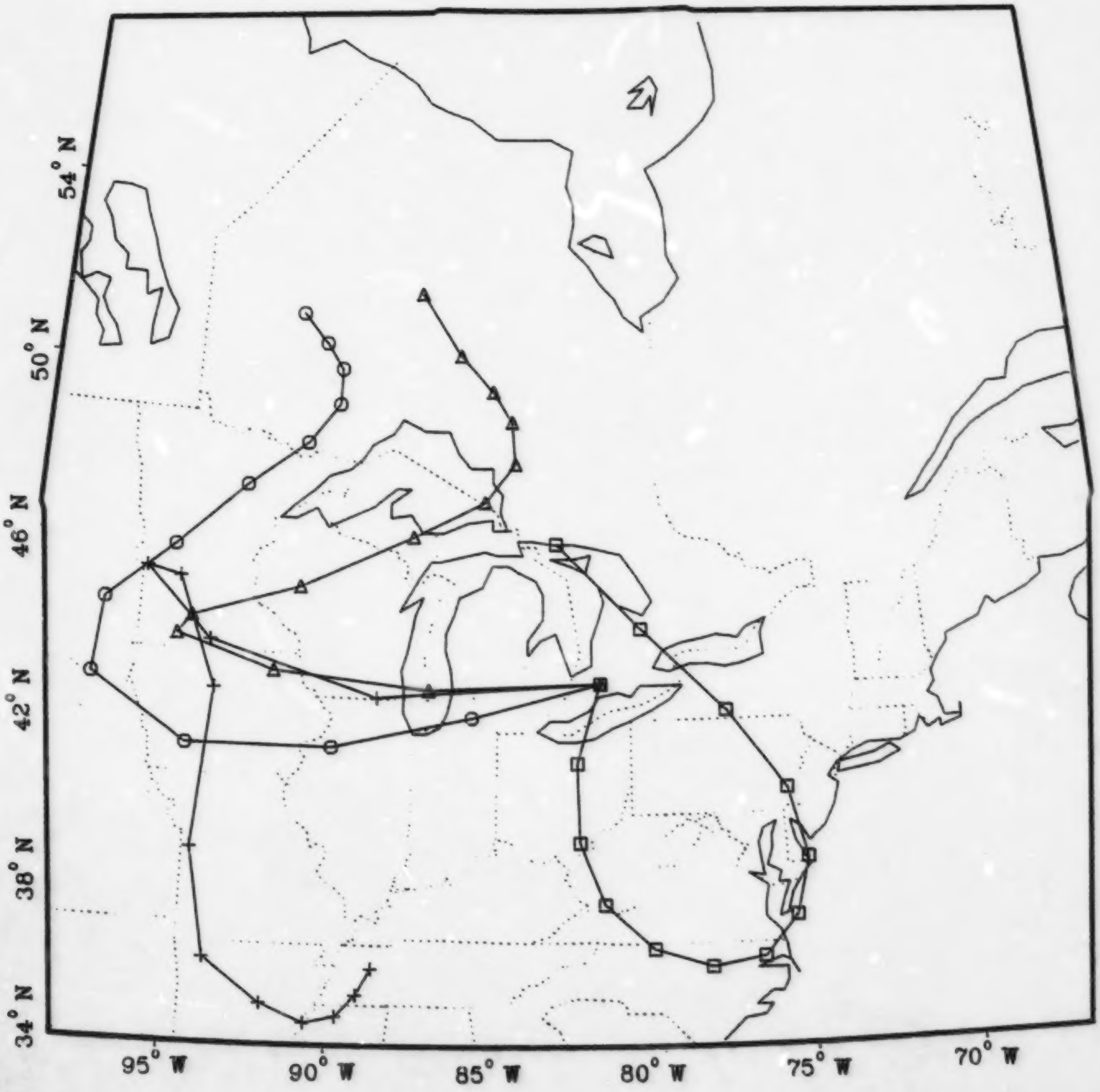

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.8

72 HOUR TRAJECTORIES
MON MAR 4 85 12 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

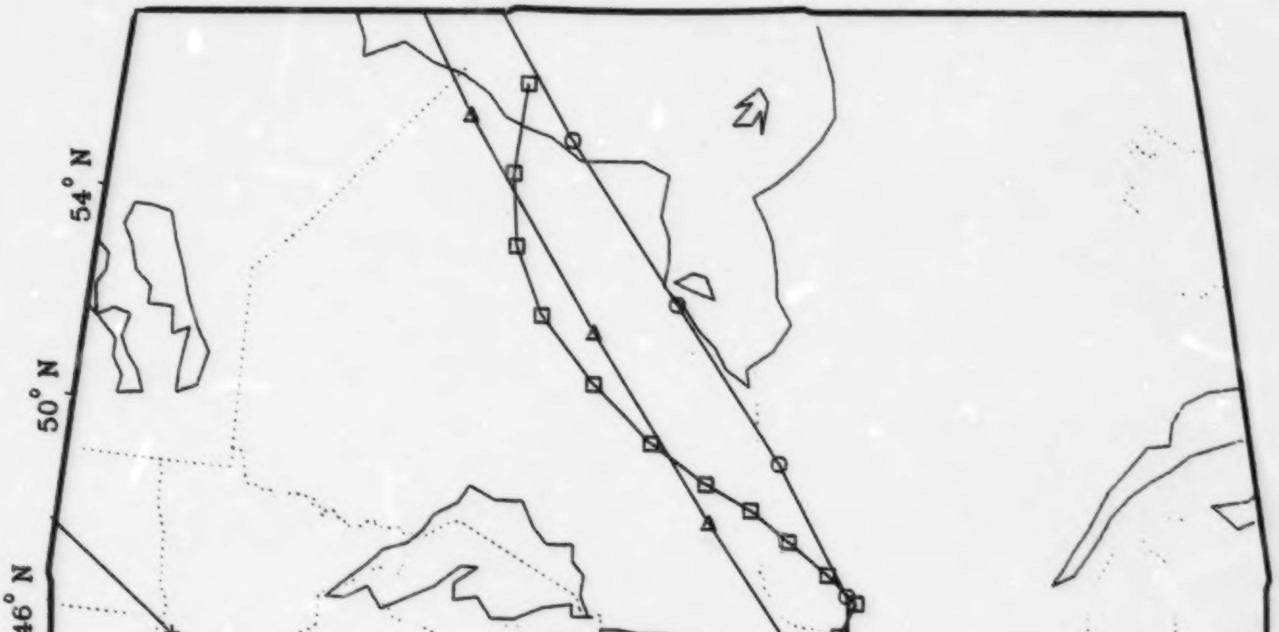

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.9

72 HOUR TRAJECTORIES
MON MAR 4 85 18 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

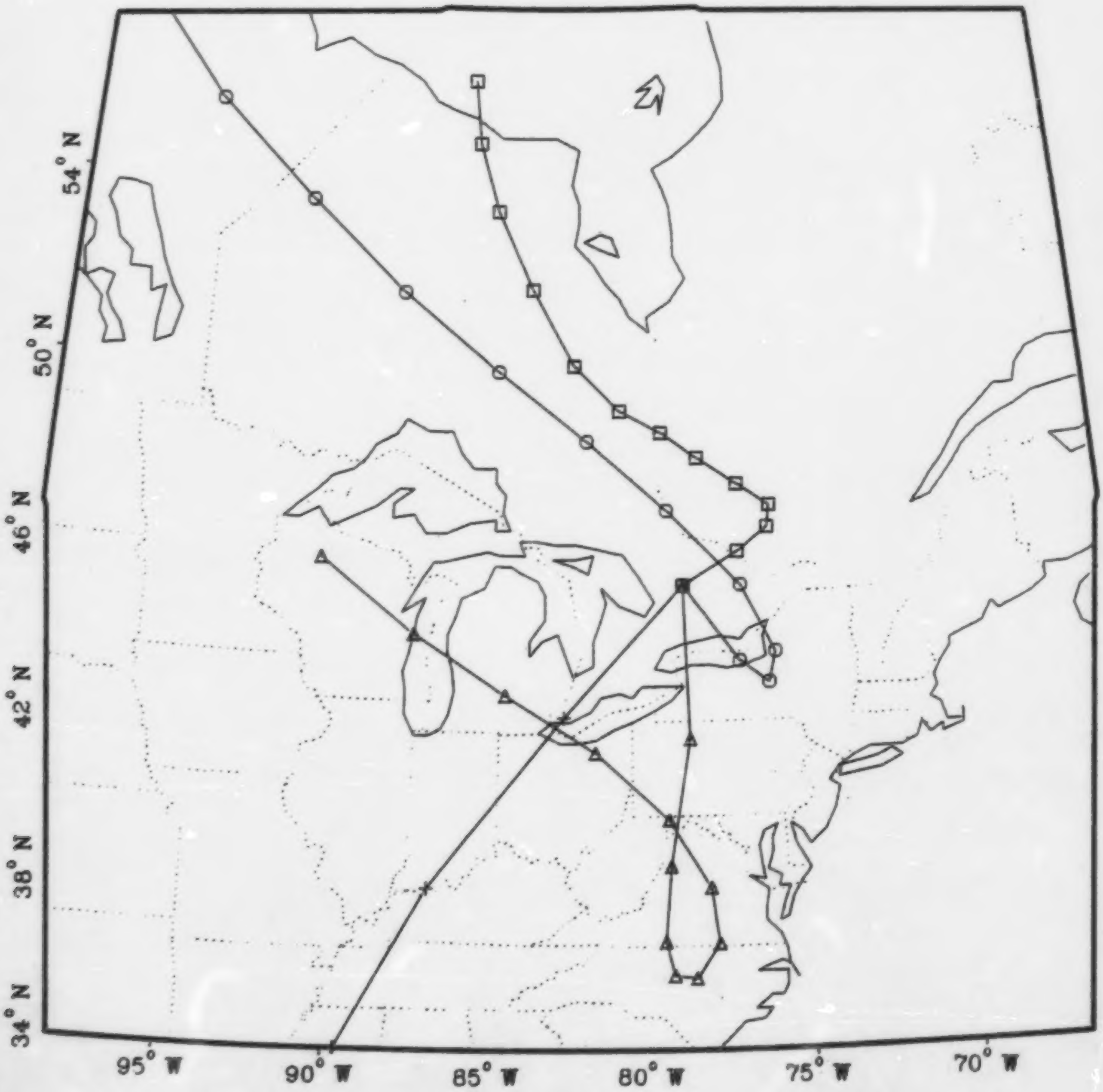

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.10

72 HOUR TRAJECTORIES
TUE MAR 5 85 0 Z
DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

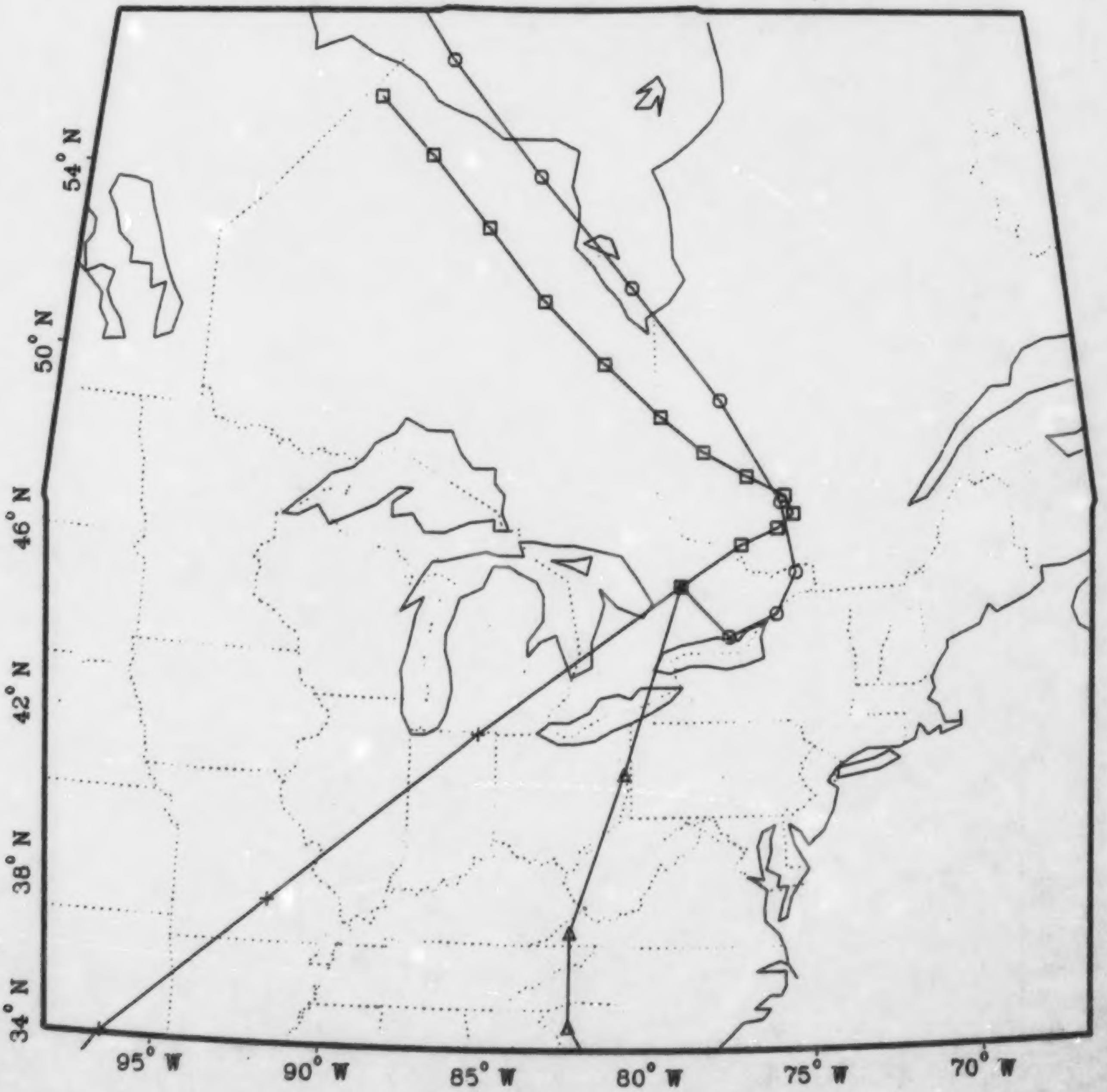
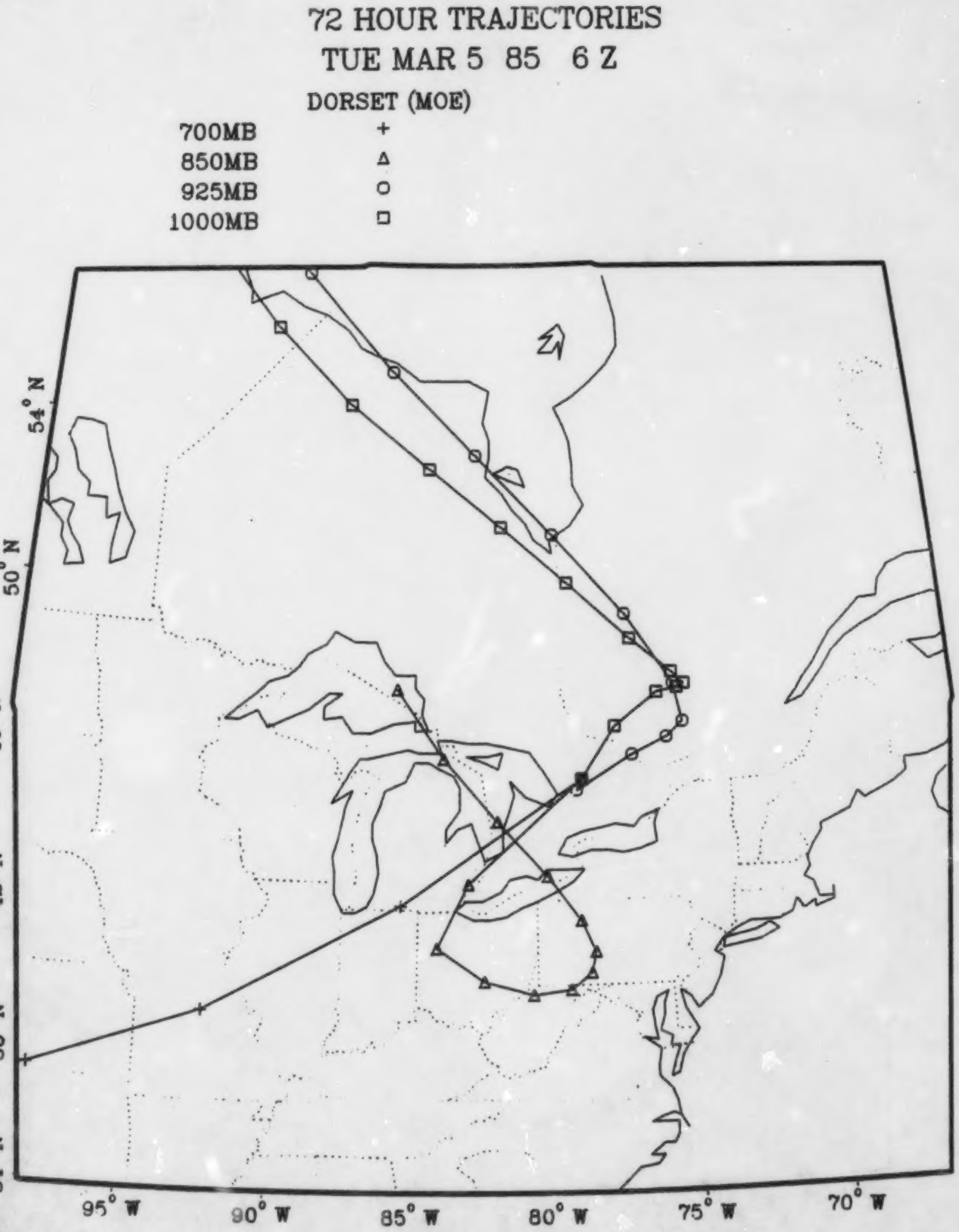

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.11



72 HOUR TRAJECTORIES
TUE MAR 5 85 6 Z
DORSET (MOE)

700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.12

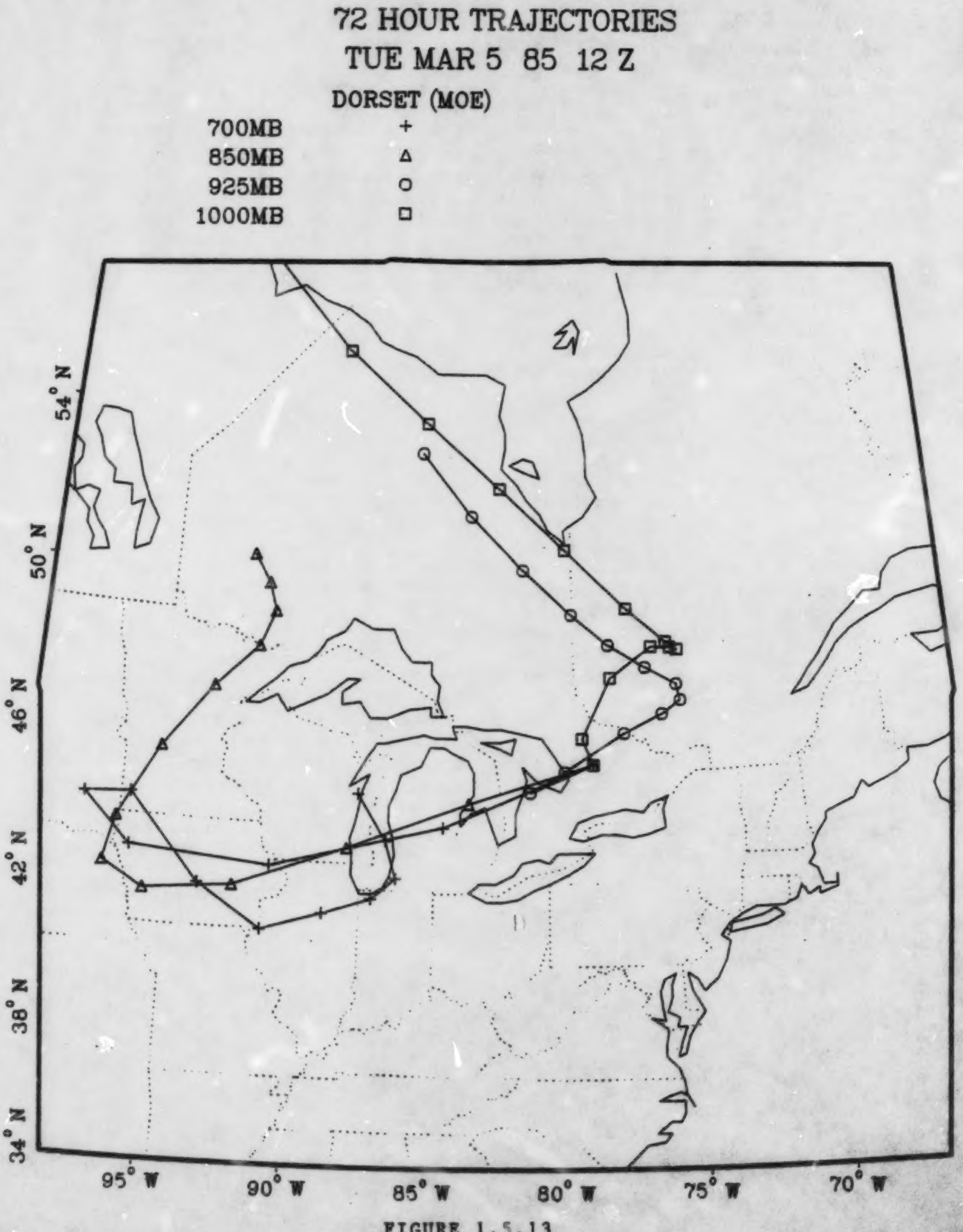

72 HOUR TRAJECTORIES
TUE MAR 5 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.5.13

1.6 April 5-6,1985, Dorset

This episode was ranked 4th (4/12) for NO_3^- wet deposition events.

On April 5, at 12Z, two frontal systems were analyzed, as shown in Fig. 1.6.1, with the upper warm front across central and the lower front across southern Ontario. Two separate low pressure centres, one near Detroit and the other over Missouri, observed at this time (see Figure 1.6.1) merged into one as the deepening Missouri low moved NE and on April 6, 12Z , it was situated near Sault ste. Marie as illustrated in Fig. 1.6.2. Dorset remained under the influence of this cyclone and light rain showers occurred frequently, as shown in Fig. 1.6.3, as the upper warm front and a trowl associated with the lower frontal system passed over Dorset area.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for April 5, at 12Z, 18Z and April 6, at 00Z, 06Z and 12Z are shown in Figures 1.6.4, 1.6.5, 1.6.6, 1.6.7 and 1.6.8 respectively.

Air parcel arriving Dorset at 1000 mb on April 5, at 12Z, did not pass over any polluted area as shown in Fig. 1.6.4. The 1000 mb trajectories did not cross over any significantly polluted area until April 6, 06Z (see Figures 1.6.5-7). However, as shown in Fig. 1.6.8, the 1000 mb trajectory passed over the highest NO_x emission New York area and SO_2 West Virginia-Maryland-Pennsylvania area.

Air trajectories at 925 mb level show(see Figures 1.6.4-8) that except on April 5,12Z when the trajectory passed near the highest SO_2 emission Detroit area, no higest emission area was involved. However, a number of high emission areas in many states were responsible for pollution transport at this level.

Air parcel arriving at 850 mb level on April 5, at 12Z as shown in Fig. 1.6.4, could have carried NO_x & SO_2 from the highest emission Chicago area and the West Virginia-Maryland-Pennsylvania area. Until April 6, 06Z, transport from the higest emission areas in Ohio, West Virginia, Maryland and Pennsylvania was possible. On April 6, 12Z, SO_2 from the highest emission Chicago area could have been transported as shown in Fig. 1.6.8.

Air trajectories at 700 mb level (see Figure 1.6.4-8) show that SO_2 from the highest emission from Illinois, Detroit area and Ohio could have been transported at this level.

In summary, a warm front and a trowl passage gave frequent rain showers at Dorset and SO_2 and NO_x from a number of emission sources could have been transported at low and high levels.

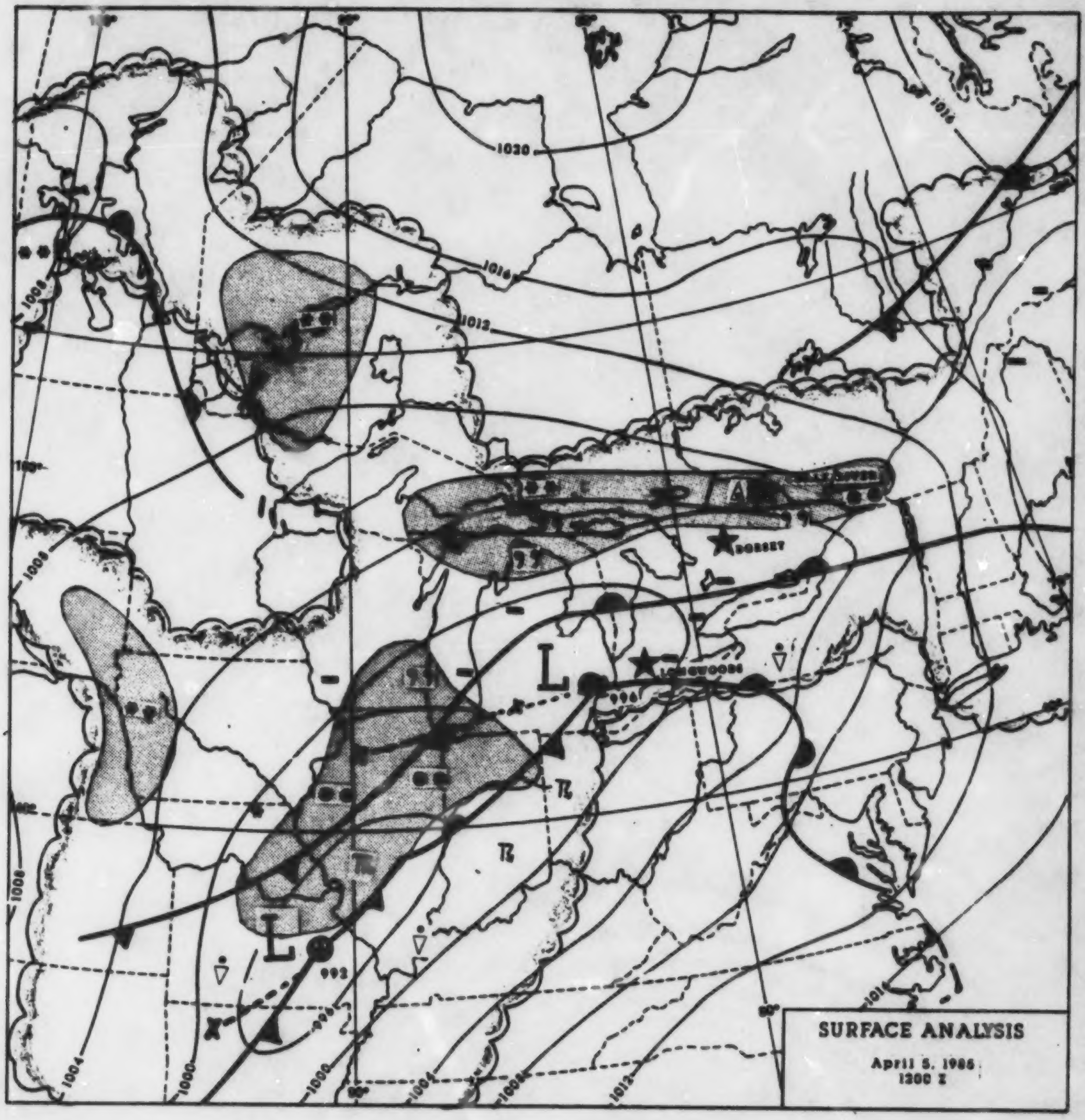

1030
1016
1012
1008
1004
1000
996
992
DORSET
LONGWOODS
SURFACE ANALYSIS
April 5, 1986
1200 Z

FIGURE 1.6.1

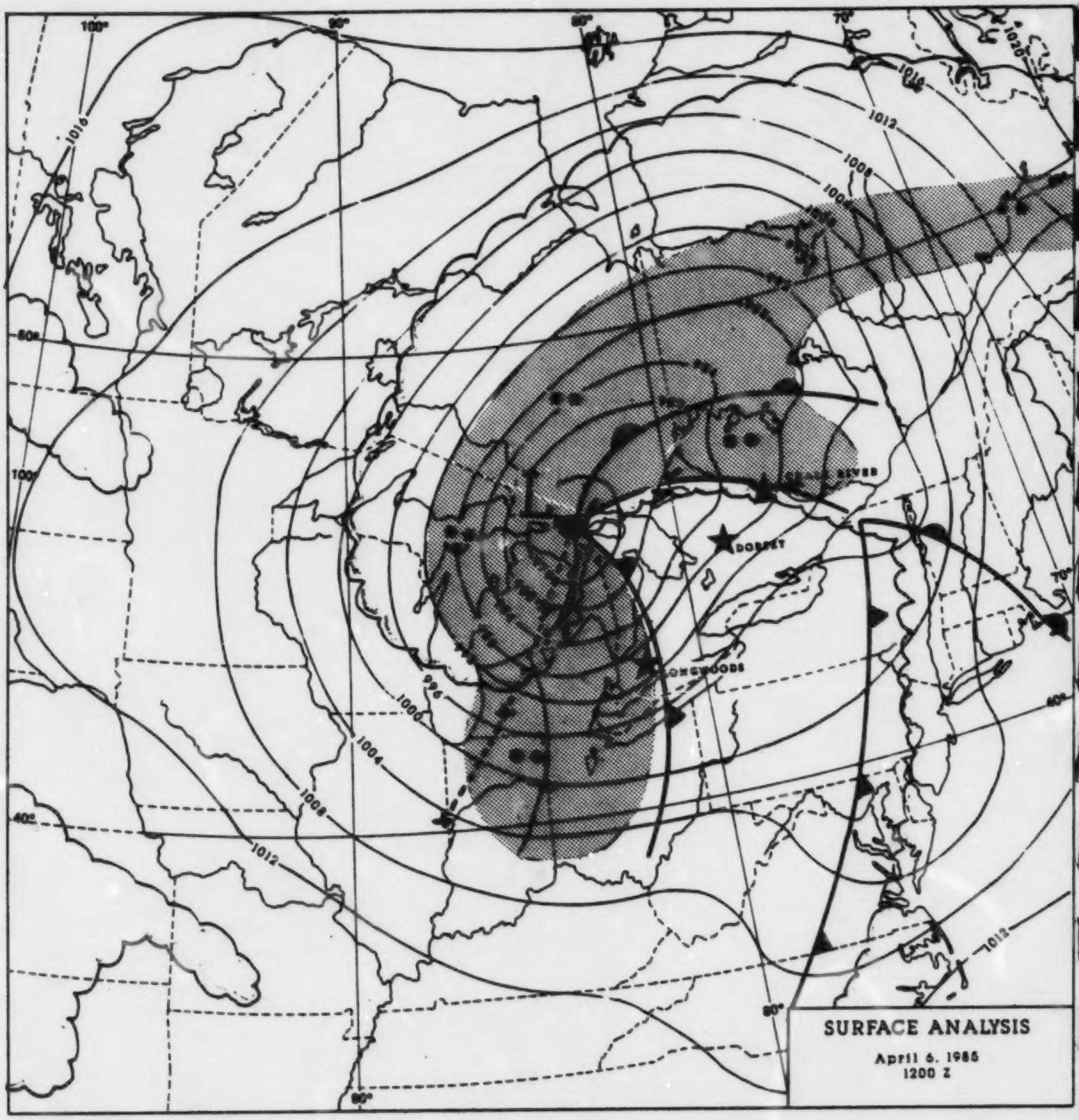

SURFACE ANALYSIS
April 6, 1985
1200 Z
DORSET
LONGWOODS
CHALK RIVER
1020
1016
1012
1008
1004
1000
996
100°
90°
80°
70°
50°
40°

FIGURE 1.6.2

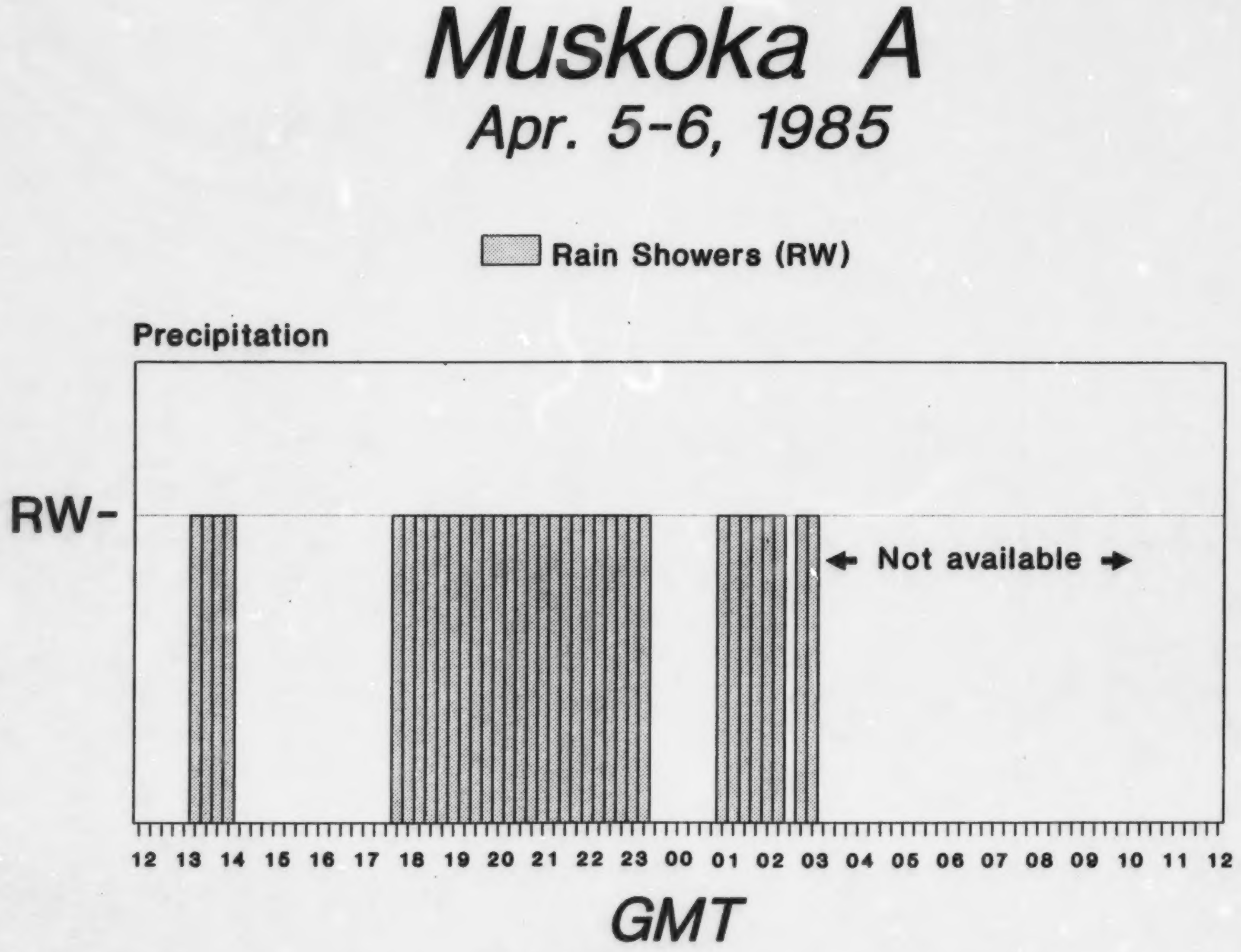

Muskoka A
Apr. 5-6, 1985
Rain Showers (RW)
Precipitation
RW-
Not available
12
13
14
15
16
17
18
19
20
21
22
23
00
01
02
03
04
05
06
07
08
09
10
11
12
GMT

FIGURE 1.6.3

72 HOUR TRAJECTORIES
FRI APR 5 85 12 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □

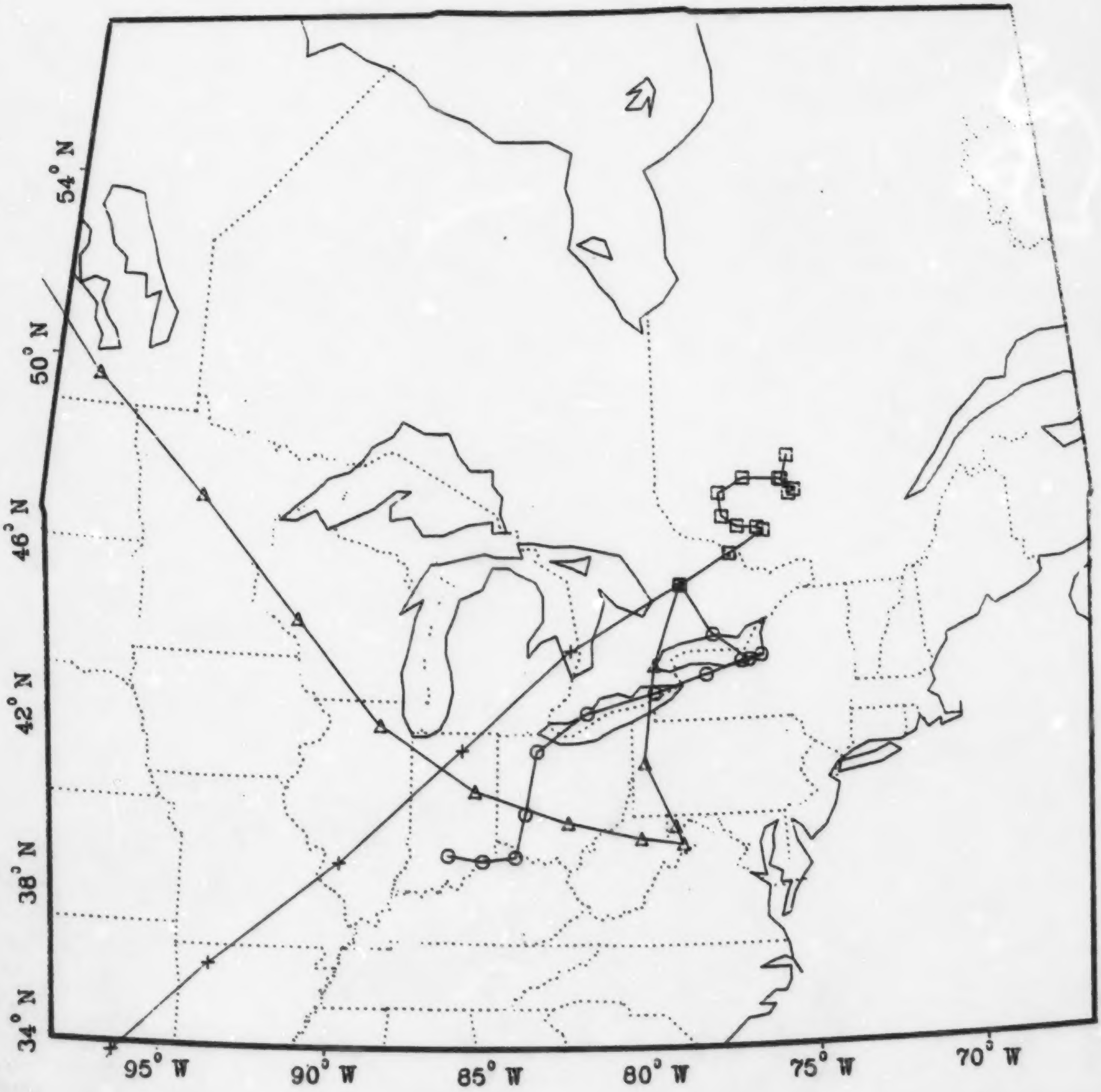

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.6.4

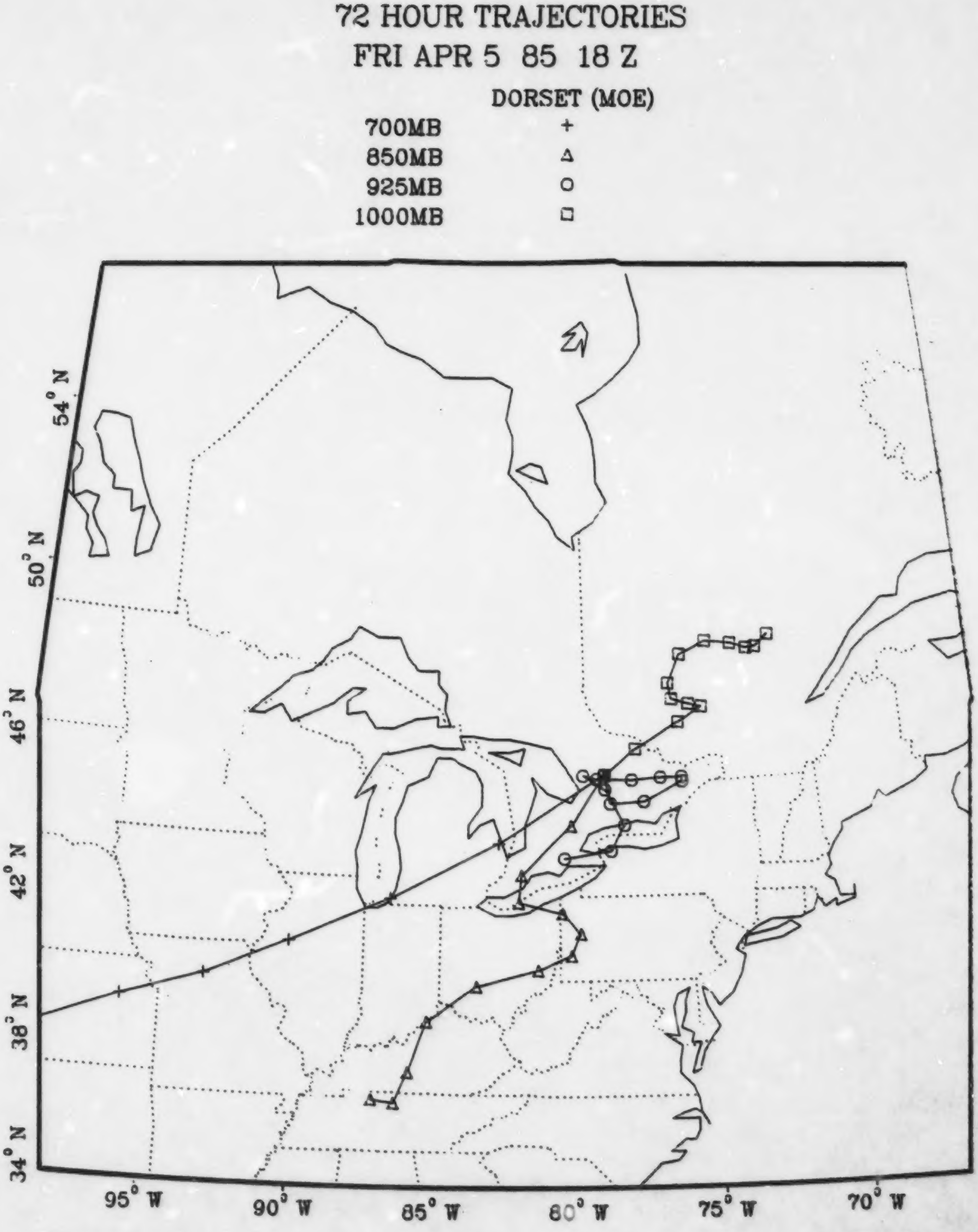

72 HOUR TRAJECTORIES
FRI APR 5 85 18 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.6.5

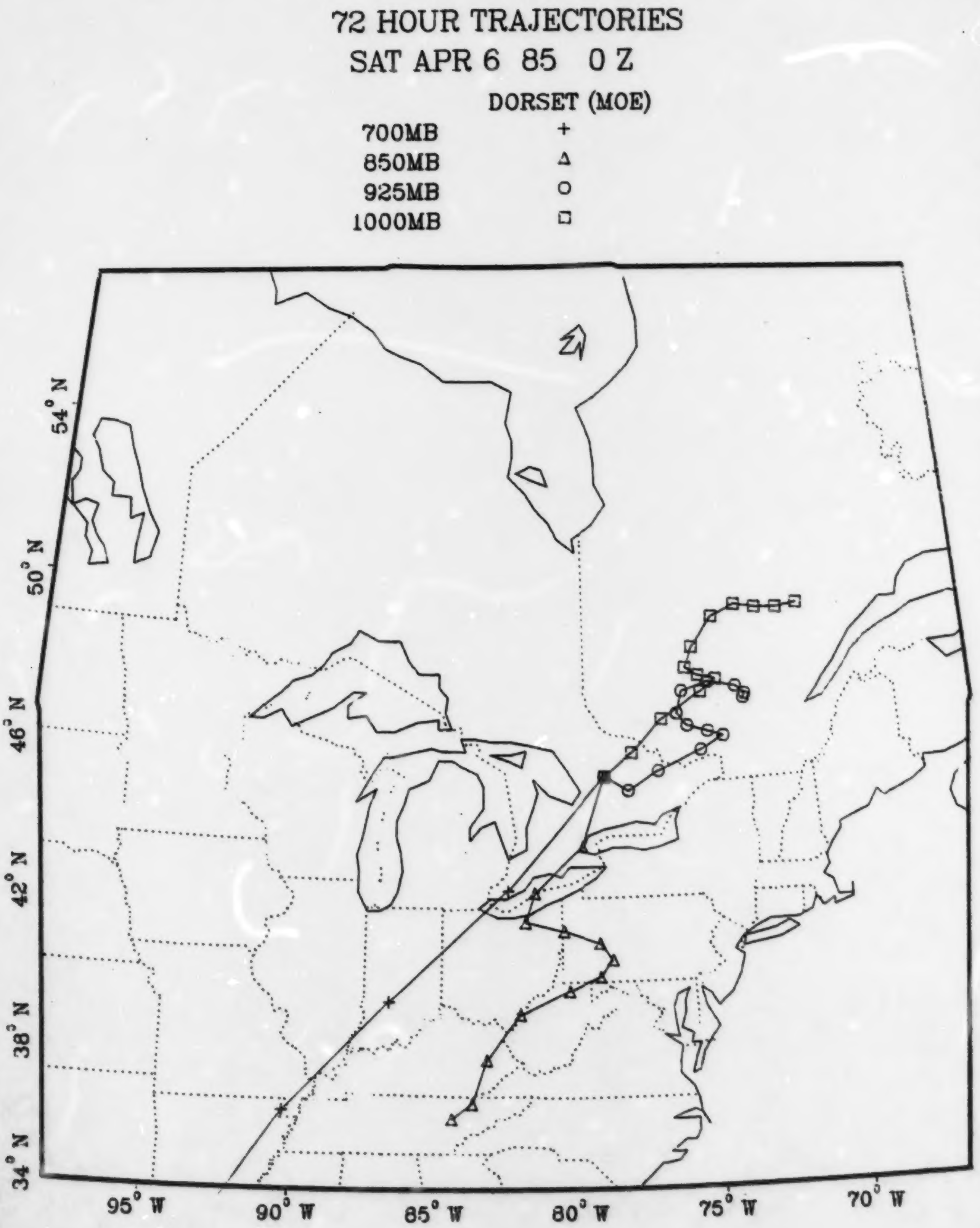

72 HOUR TRAJECTORIES
SAT APR 6 85 0 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.6.6

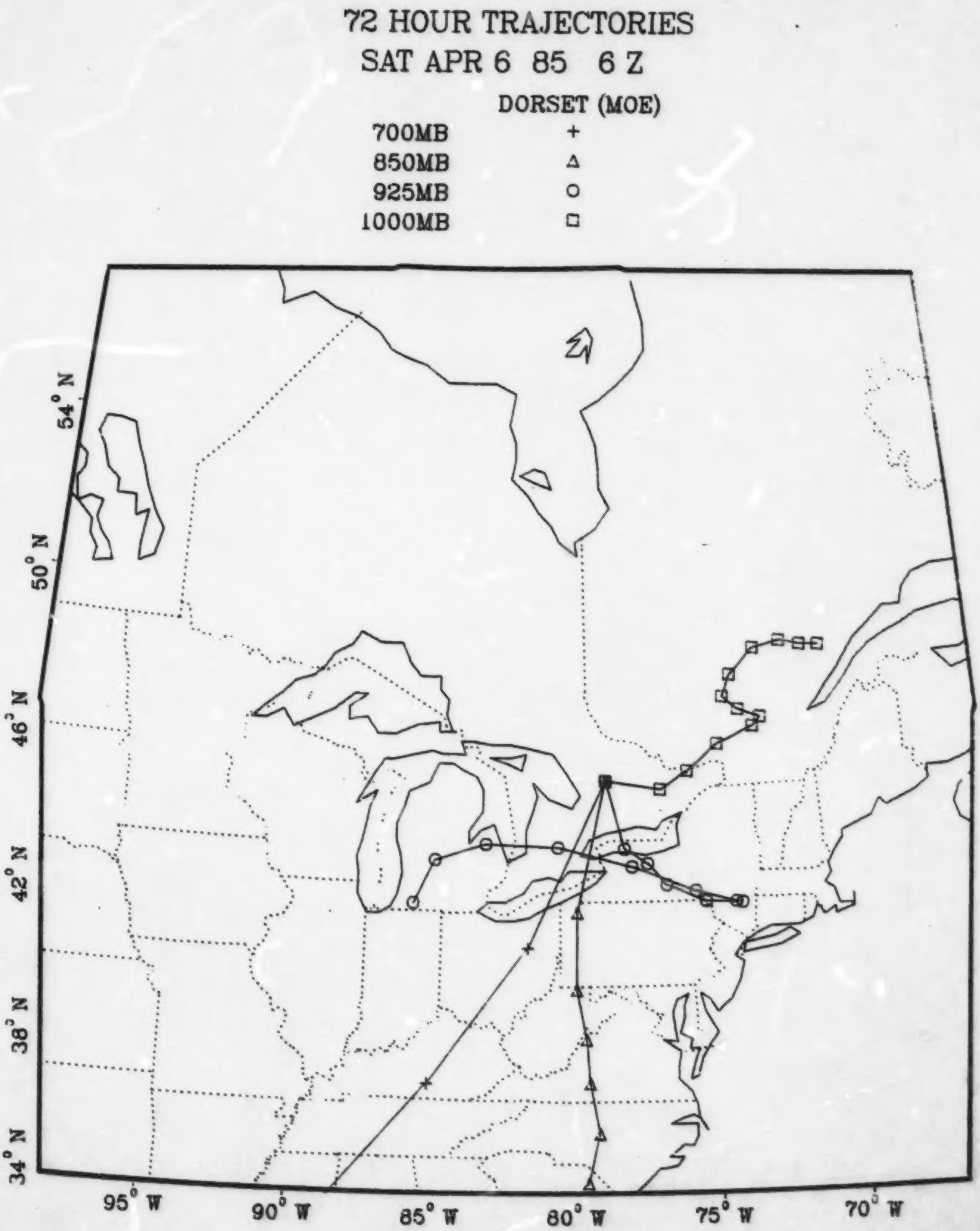

72 HOUR TRAJECTORIES
SAT APR 6 85 6 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.6.7

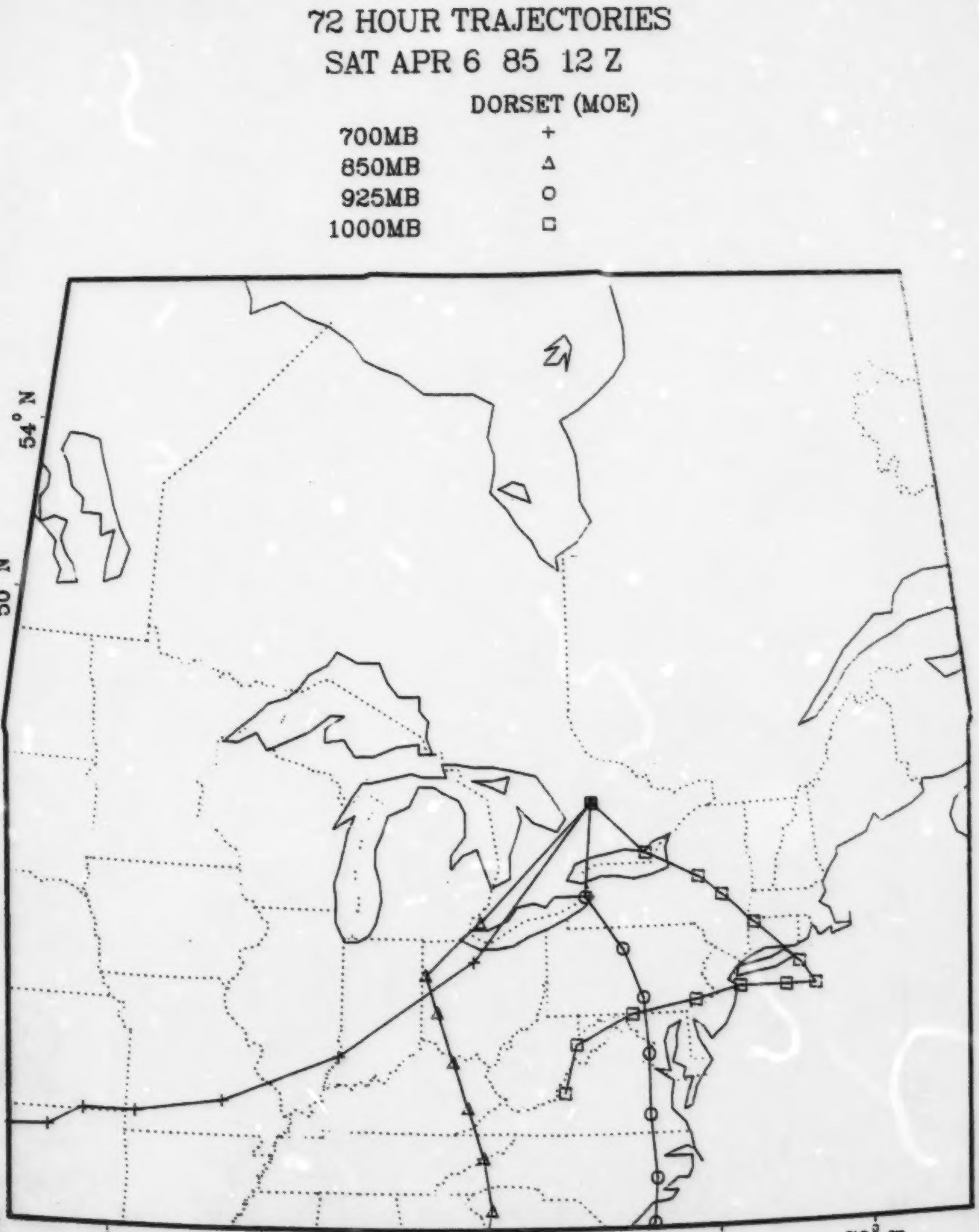

72 HOUR TRAJECTORIES
SAT APR 6 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.6.8

1.7 April 13-14, 1985. Chalk River

This was ranked 3rd (3/5) for $SO_4^=$ and first (1/7) for NO_3^- wet deposition events at Chalk River.

A low pressure centre of 1003 mb over Minnesota with a frontal system such that the warm front crossed over southern Ontario was analyzed on April 13, at 12Z, as shown in Fig. 1.7.1. A continuous precipitation area giving snow, freezing rain and rain was associated with the frontal system. Another frontal system was also analyzed. The low pressure centre and the associated warm front moved very slowly such that the southern ontario remained under the influence of the warm front throughout this episode. On April 14, at 12Z, the low pressure centre was located near Chicago filling slightly to 1004 mb as shown in Fig. 1.7.2. With the movement of this system the continuous precipitation area passed over the station and ice pellets, freezing rain and rain showers were observed at Petawawa A, the nearest weather station to Chalk River as shown in Fig. 1.7.3. The warm front did not pass over Chalk River during this episode.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for April 13, at 12Z, 18Z and April 14, at 00Z, 06Z and 12Z are shown in Figures 1.7.4, 1.7.5, 1.7.6, 1.7.7 and 1.7.8 respectively.

The air trajectories for 1000 mb level show (see Figures 1.7.4-8) that they did not pass over any polluted area during the entire episode.

Air parcels arriving Chalk River at 925 mb level show that SO_2 from Lake Abitibi-Noranda Mines and Inco at Sudbury could have been transported on April 14 during 06-12Z, as illustrated in Figures 1.7.7-8. However, this transport was not sustained as the trajectories quickly passed over these areas.

The air trajectories for 850 mb level show that SO_2 on April 13 during 12-18Z, as shown in Figures. 1.7.4-5, from the highest emission Lake Abitibi-Noranda Mines area could have been transported. As the trajectory's path changed afterwards, as shown in Figures 1.7.6-8, SO_2 from Sudbury, Chicago, Detroit area as well as other Illinois area could also have been transported on April 14 during 00Z-12Z but the transport was not on a sustained basis.

The air trajectories for the 700 mb level show that no significant pollutant transport occurred on April 13 until 18Z as shown in Figures 1.7.4-5. However, SO_2 from the Sudbury and Chicago area and NO_x from Chicago area occurred from 00Z to 12Z on April 14 as exhibited in Figures 1.7.6-8.

In summary, no(warm) front passed over the station but precipitation in the form of ice pellets, freezing rain and rain showers associated with the warm front occurred at Chalk River. Significant transport of NO_x from Chicago area and of SO_2 from Chicago and Sudbury area at high level (700 mb) took place. Pollutant transport at other levels seems less important for this event.

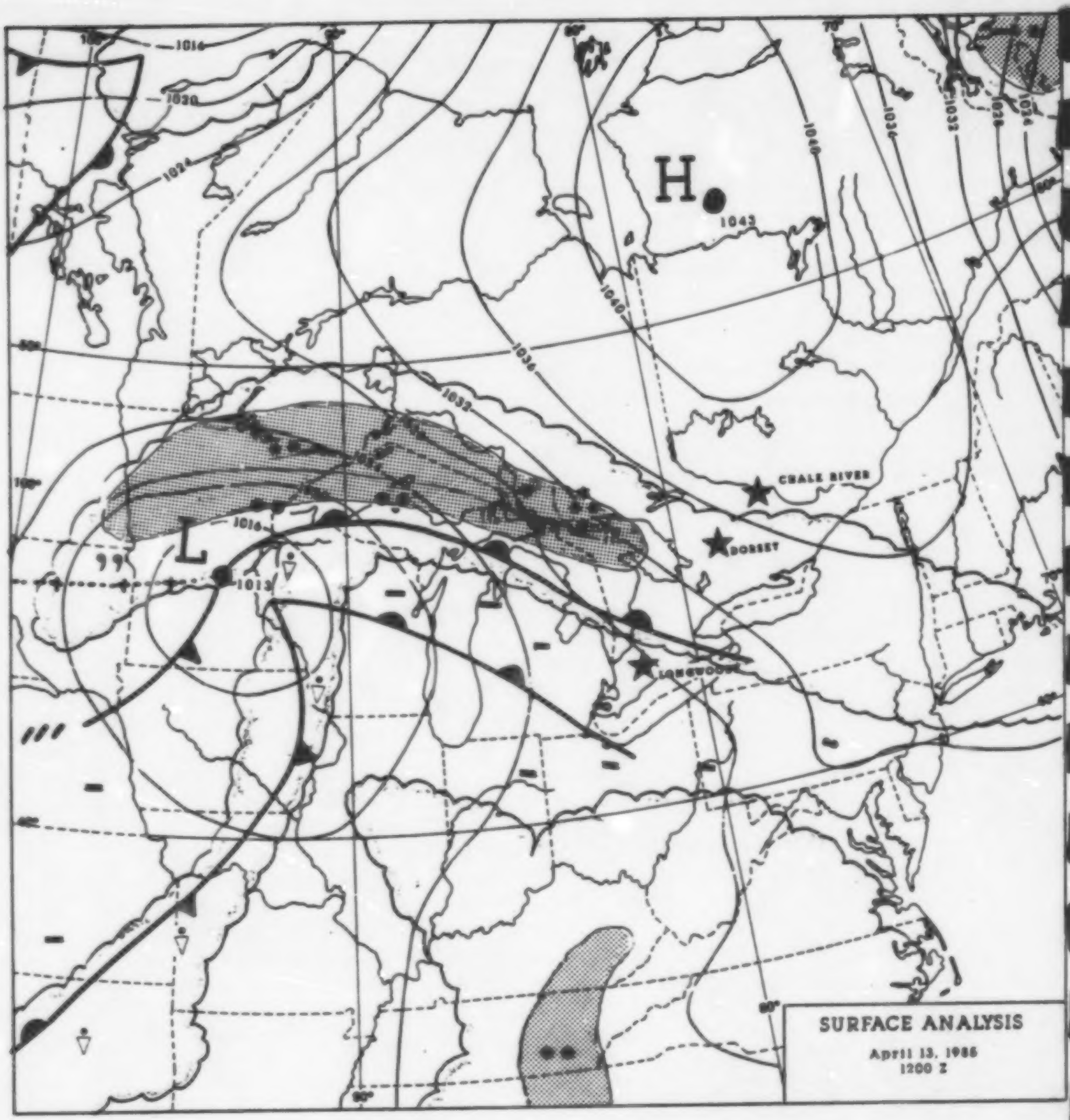

H
1043
1040
1036
1032
1028
1024
1020
1016
L
1013
CHALK RIVER
DORSET
LONGWOOD
SURFACE ANALYSIS
April 13, 1986
1200 Z

FIGURE 1.7.1

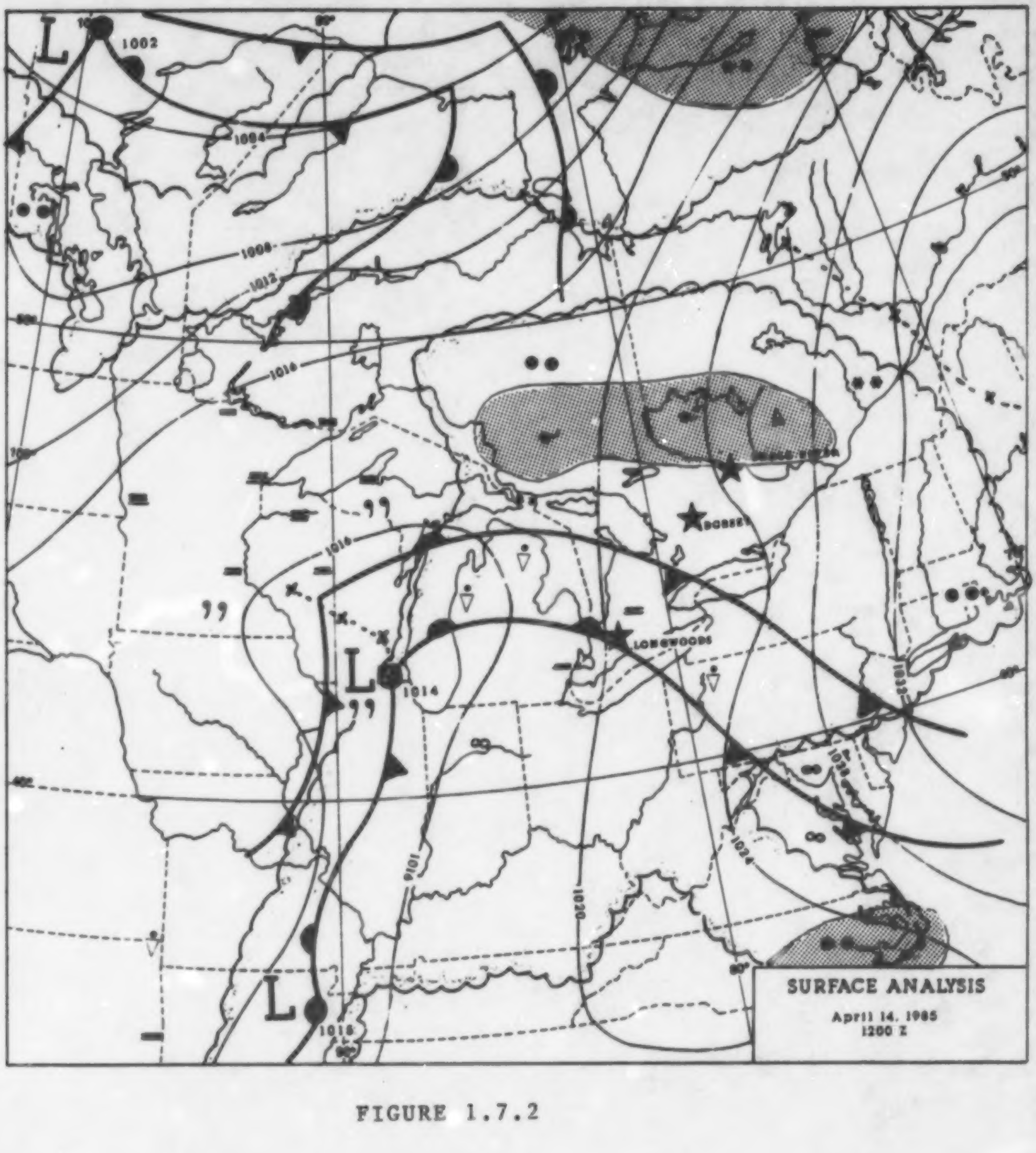
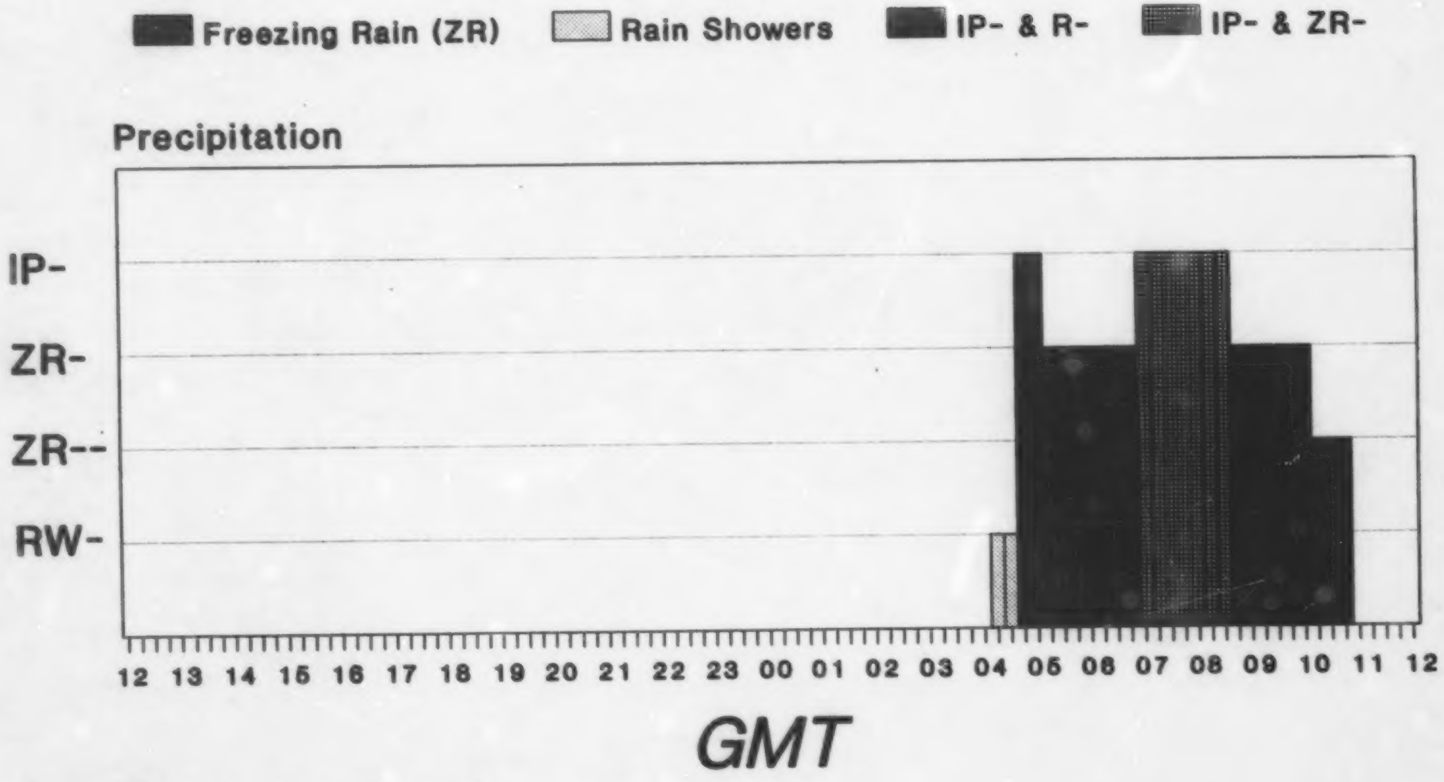

L
1002
1004
1008
1012
1016
1016
L
1014
1016
1020
1024
1028
1032
DORSET
LONGWOODS
L
1016
SURFACE ANALYSIS
April 14, 1985
1200 Z

FIGURE 1.7.2

Petawawa A

Apr. 13-14, 1985



R - Rain, RW - Rain Showers
IP - Ice pellets

FIGURE 1.7.3

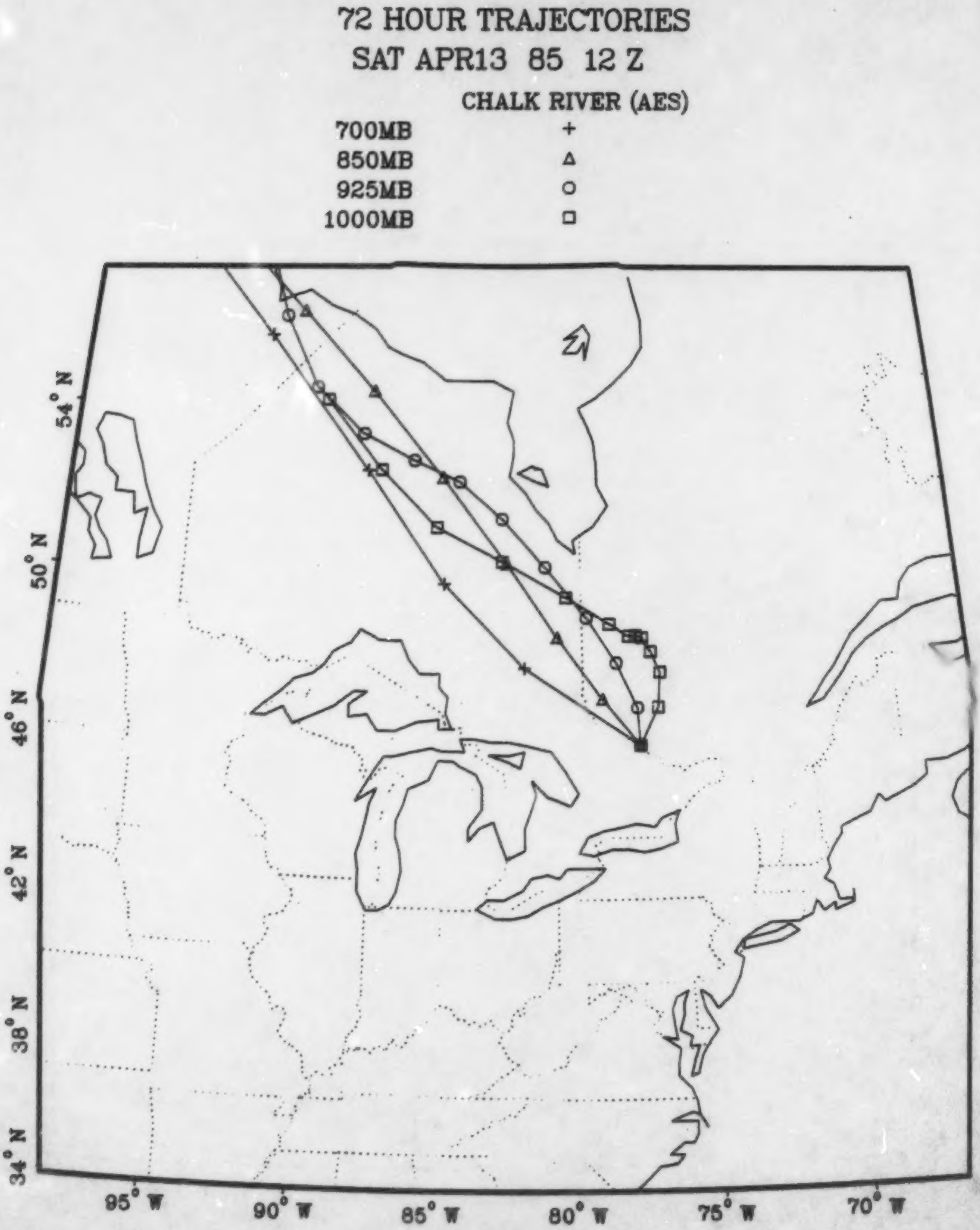

72 HOUR TRAJECTORIES
SAT APR13 85 12 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.7.4

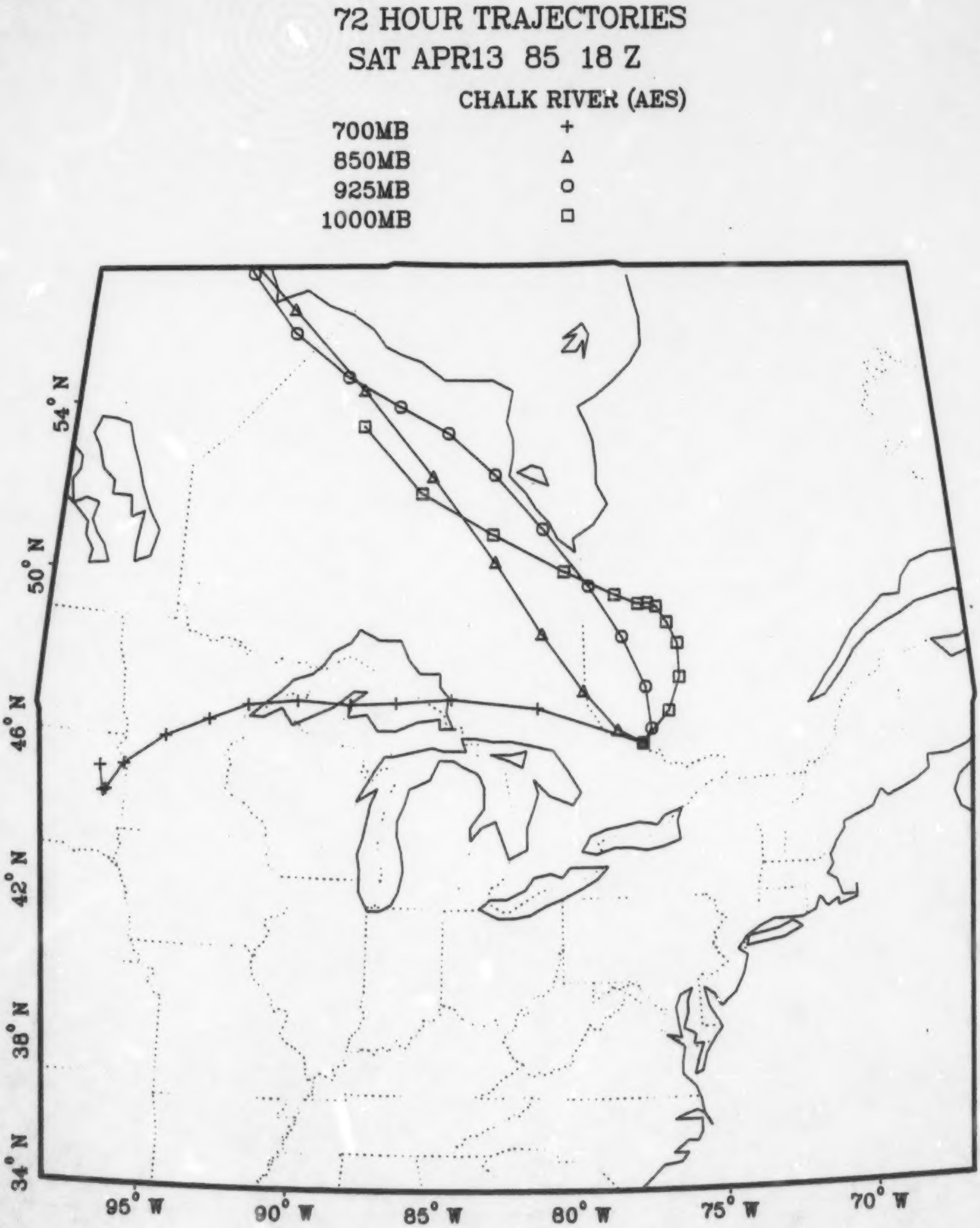

72 HOUR TRAJECTORIES
SAT APR13 85 18 Z
CHALK RIVER (AES)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.7.5

72 HOUR TRAJECTORIES
SUN APR14 85 0 Z

	CHALK RIVER (AES)
700MB	+
850MB	△
925MB	○
1000MB	□

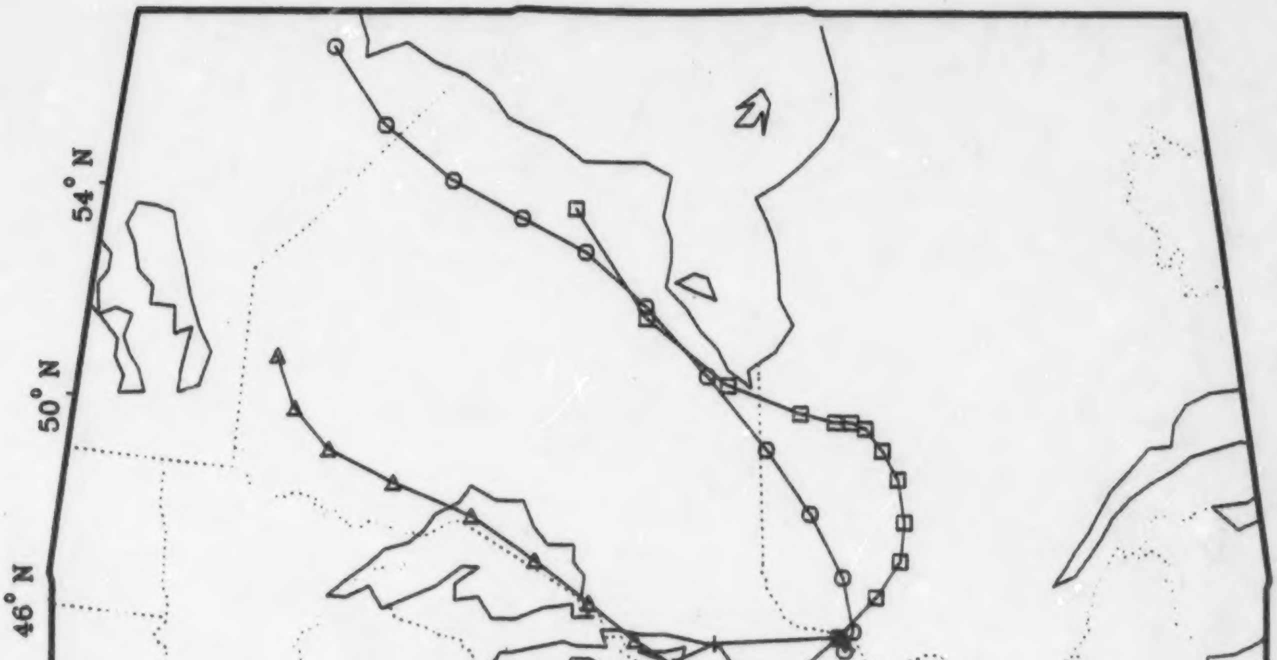

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.7.6

72 HOUR TRAJECTORIES
SUN APR14 85 6 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

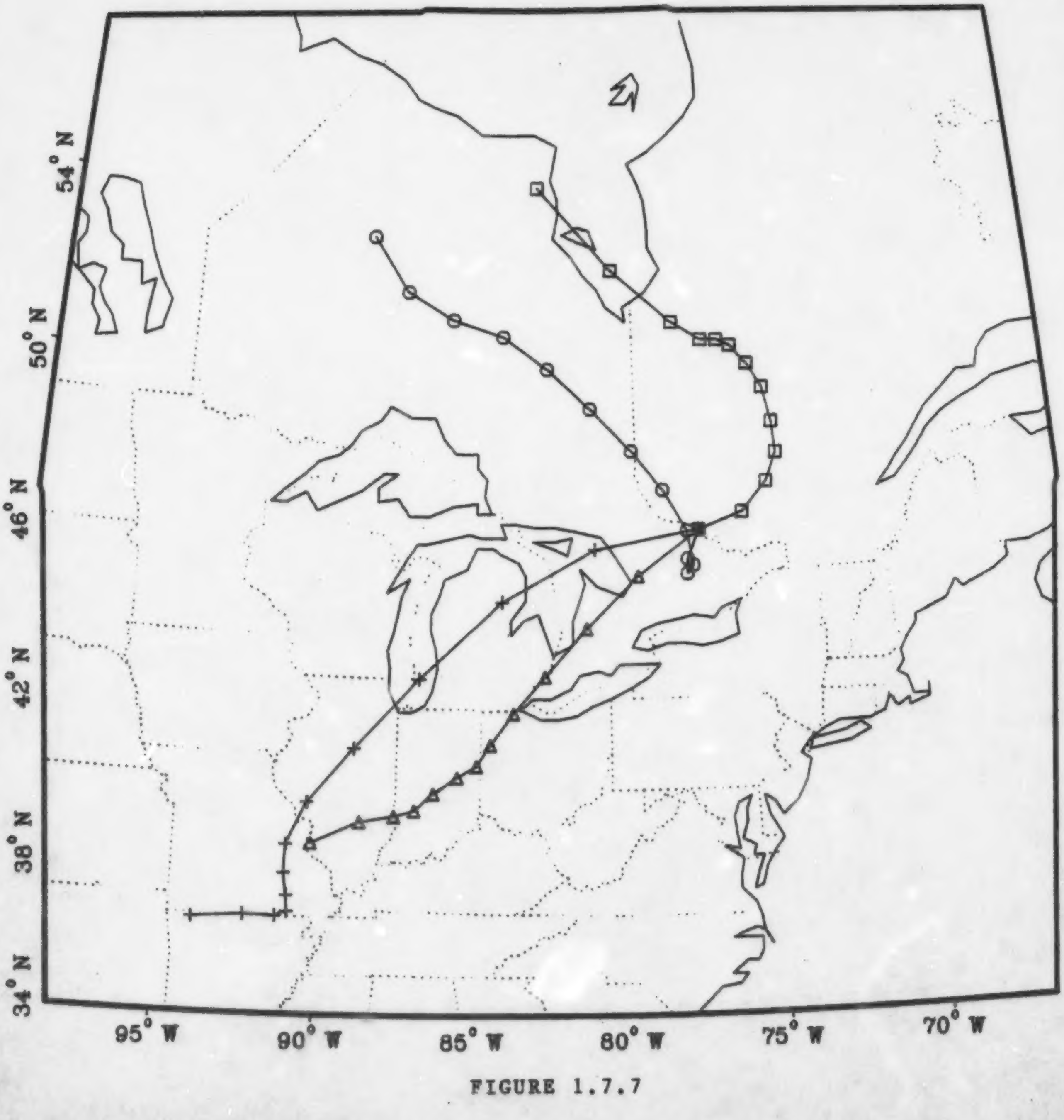

N
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.7.7

72 HOUR TRAJECTORIES
SUN APR14 85 12 Z

	CHALK RIVER (AES)
700MB	+
850MB	△
925MB	○
1000MB	□

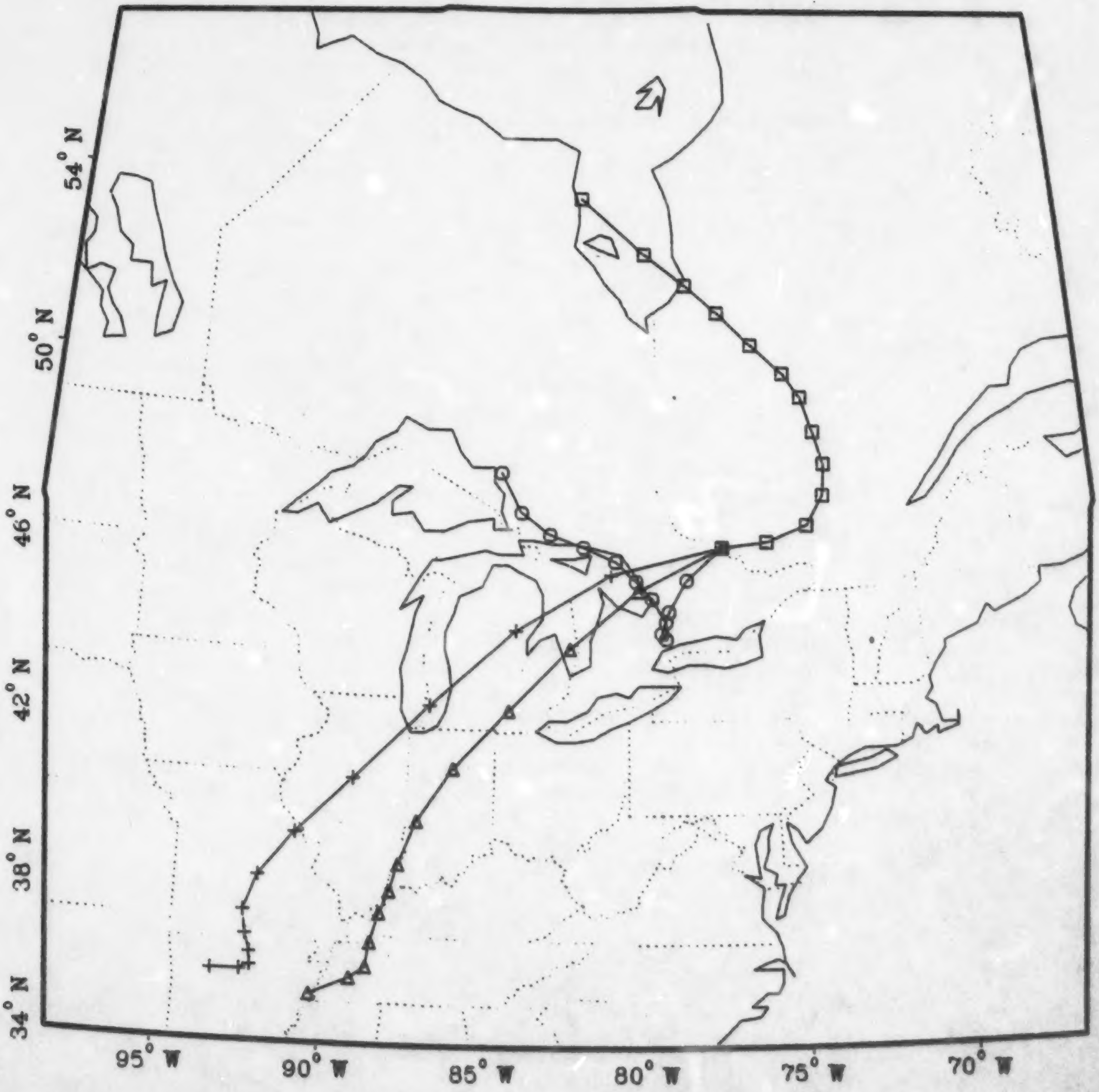

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.7.8

1.8 April 14-15, 1985. Chalk River

This episode ranked 6th (6/7) for NO_3^- wet deposition events at Chalk River.

On April 14, at 12Z, two separate frontal systems as shown in Fig. 1.8.1 were analyzed with a low pressure centre of 1014 mb near Chicago and stationary fronts over southern Ontario. Later synoptic analyses(not shown here) did not identify two separate fronts. The low pressure centre moved eastward with warm front moving northward and passing over Chalk River on April 15, at about 00Z. Afterwards, this system could no longer be analyzed in synoptic surface maps and another system with an upper level trough was observed. On April 15, at 12Z, a low, 1008 mb, over Illinois with a frontal system was analyzed as shown in Fig. 1.8.2. A continuous precipitation area near Chalk River yielded light rain showers at Petawawa on April 14 morning(13-14Z). As the warm front passed over and an upper level trough approached the station, rain and rain showers fell as shown in Fig. 1.8.3. The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for April 14, at 12Z, 18Z and April 15, at 00Z, 06Z and 12Z are shown in Figures 1.8.4, 1.8.5, 1.8.6, 1.8.7 and 1.8.8 respectively.

Air parcels arriving Chalk River at 1000 mb level during this episode, as exhibited in Figures 1.8.4-8, did not come from any polluted area and therefore this level is insignificant in NO_x transport.

Air trajectories for 925 mb level show that on April 14 till 18Z as shown in FIgures 1.8.4-5, their path did not cross over any high NO_x emission sources. However by 06Z on April 15, they had changed such that NO_x from high emission source in Ohio-West Virginia could have been transported.

Air parcels arriving at 850 mb level from April 14, 12Z to April 15, 00Z did not travel over any high NO_x emission area as shown in Figures 1.8.4-6. From 06Z to 12Z on April 15, trajectory path passed over NO_x high emission Detroit area as illustrated in Figures 1.8.7-8 and NO_x could have been transported.

The air trajectories for 700 mb level show that NO_x from the highest Chicago and high St. Louis, Missouri area on April 14, at 12Z (see Fig. 1.8.4) could have been transported to Chalk River. No significant transport seems evident later on as trajectory's path did not pass over any high NO_x emission area (see Figures 1.8-5-8).

Summarizing, a warm frontal passage and an upper trough yielded very light rain and light & very light rain showers for several hours. NO_x transport at low level (925 mb) from Ohio-West Virginia and at high level (850 mb & 700 mb) from Chicago, St. Louis and Detroit area were likely.

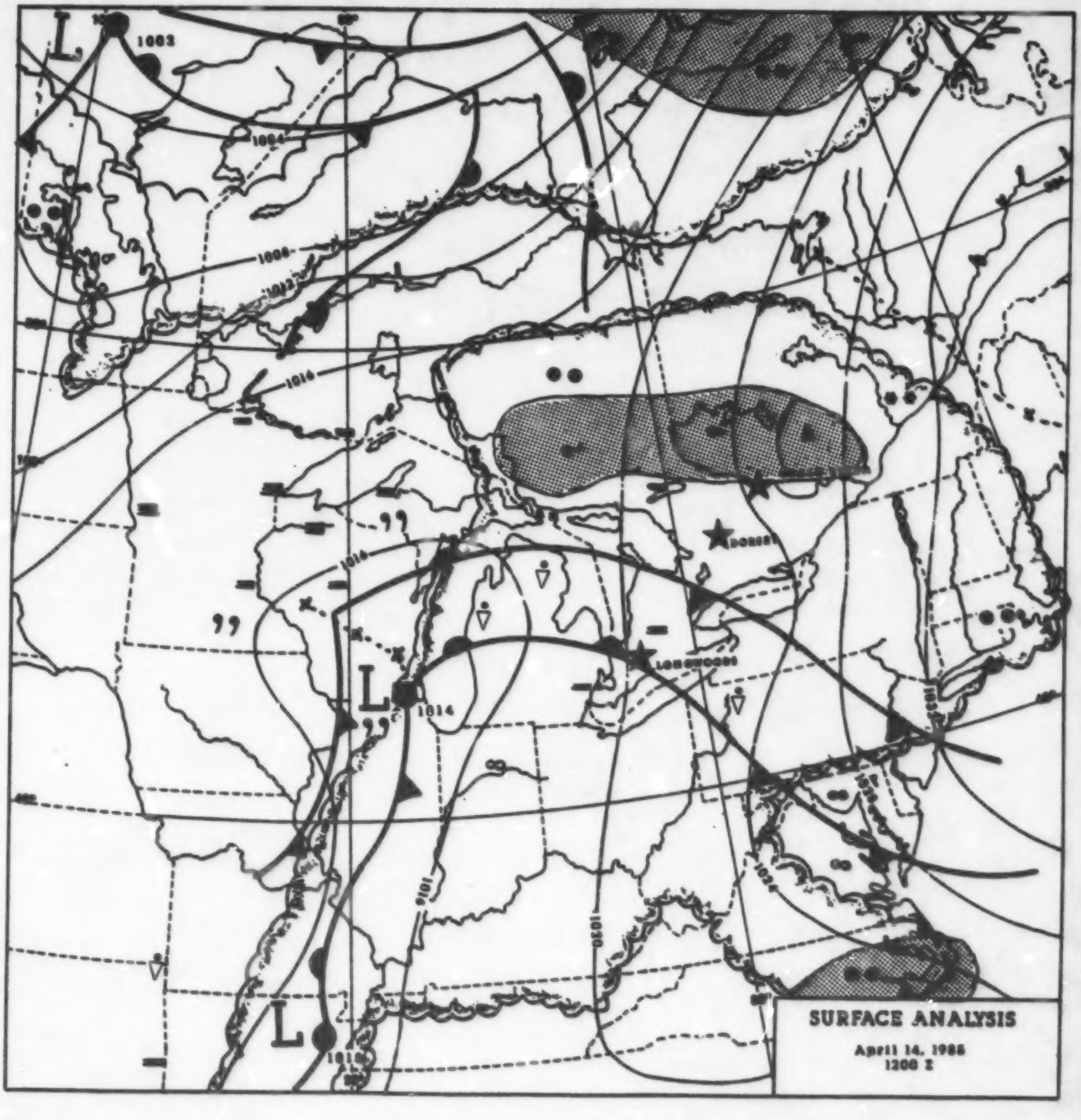

L
1003
1004
1008
1012
1016
DORSET
LONGWOODS
L
1014
1016
1020
1024
1028
1032
L
1016
SURFACE ANALYSIS
April 14, 1985
1200 Z

FIGURE 1.8.1

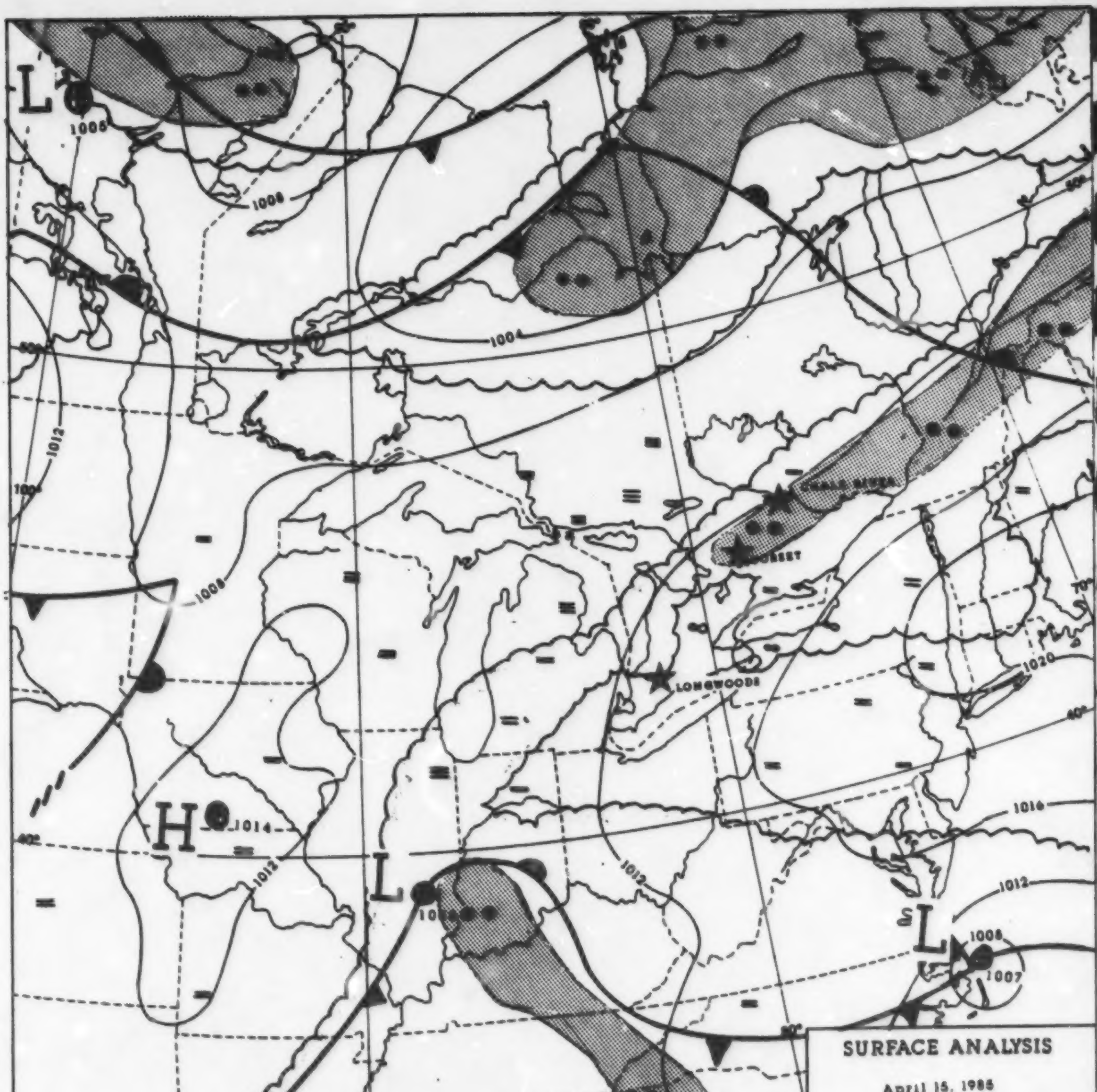
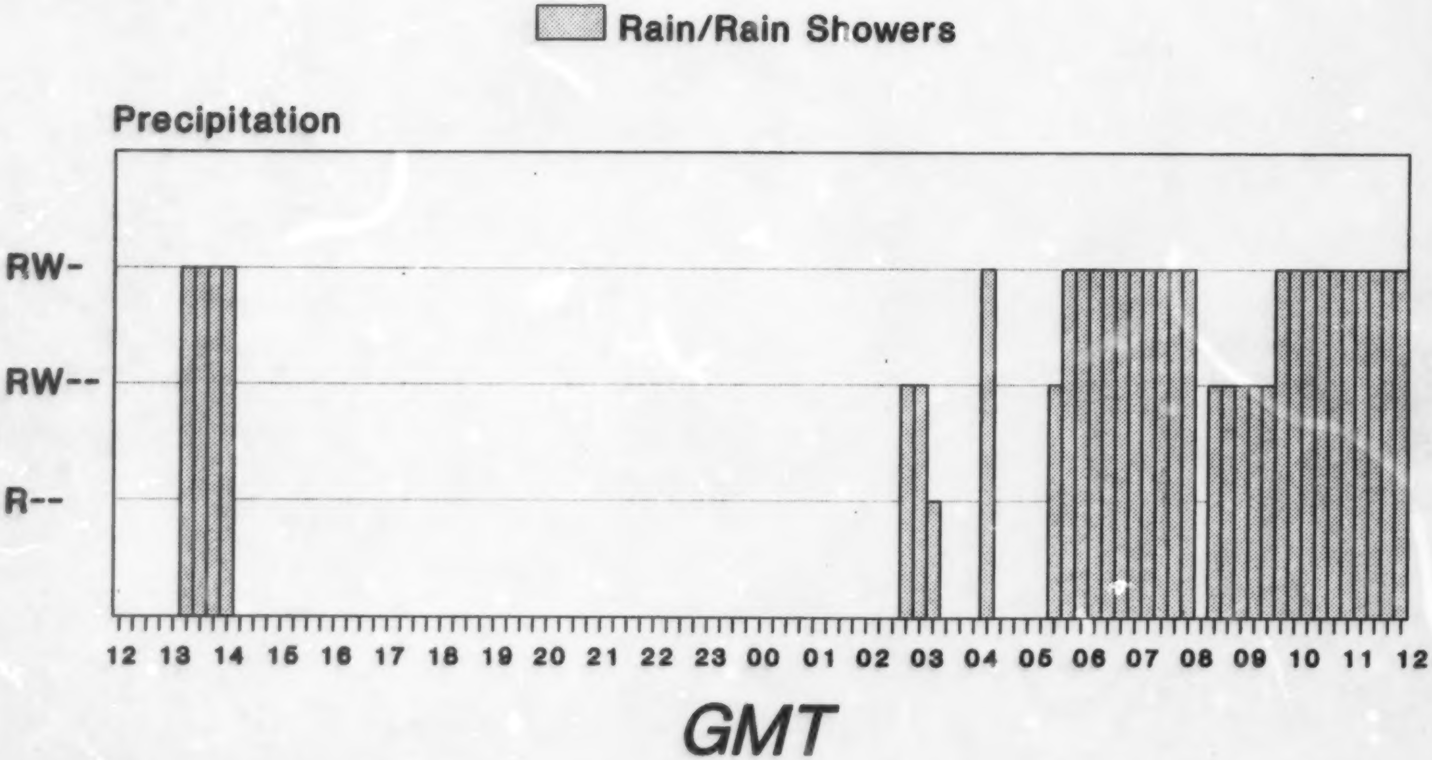

L
1005
1008
1004
1012
1008
H
1014
1012
L
1012
1012
1016
1020
L
1008
1007
1012
CHALK RIVER
ORSET
LONGWOODS
SURFACE ANALYSIS
April 15, 1985
1200 Z

FIGURE 1.8.2

Petawawa A
Apr. 14-15, 1985



R - Rain
RW - Rain showers

FIGURE 1.8.3

72 HOUR TRAJECTORIES
SUN APR14 85 12 Z

	CHALK RIVER (AES)
700MB	+
850MB	△
925MB	○
1000MB	□

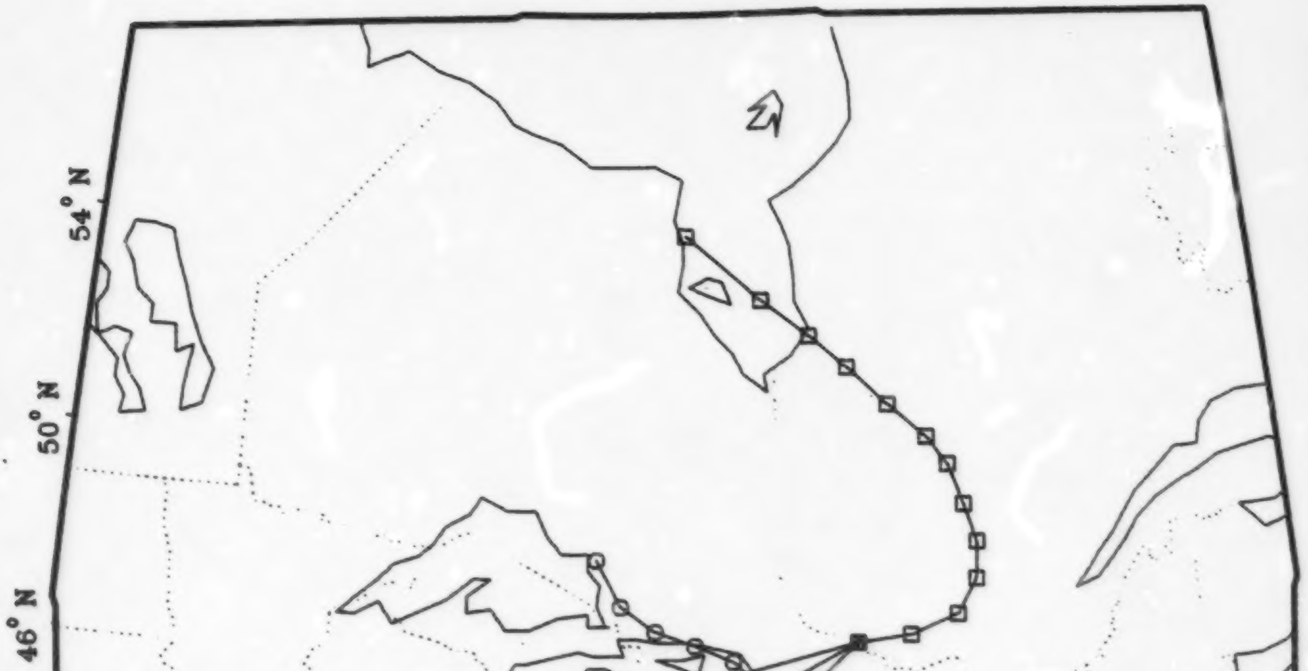

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.8.4

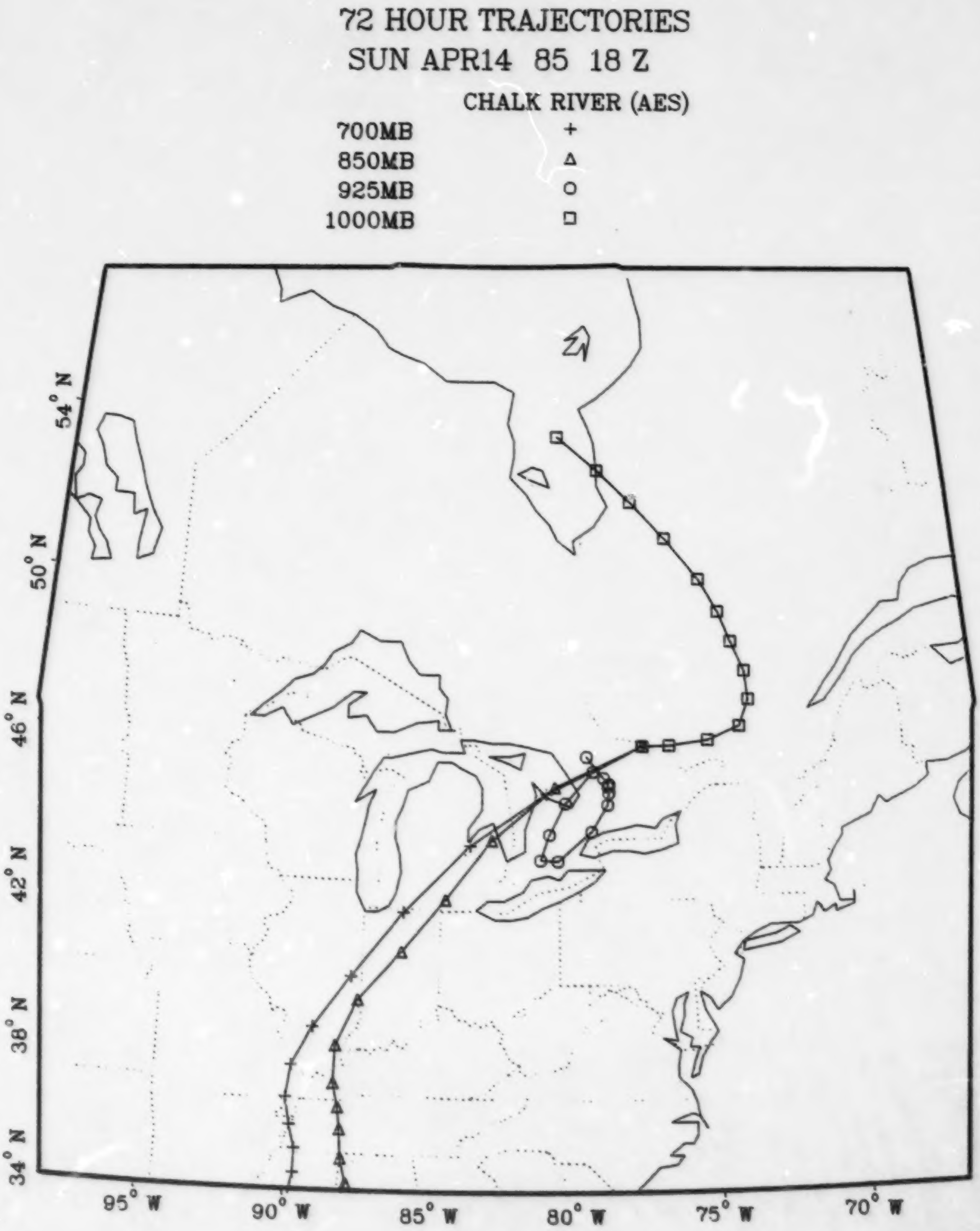

72 HOUR TRAJECTORIES
SUN APR14 85 18 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.8. 5

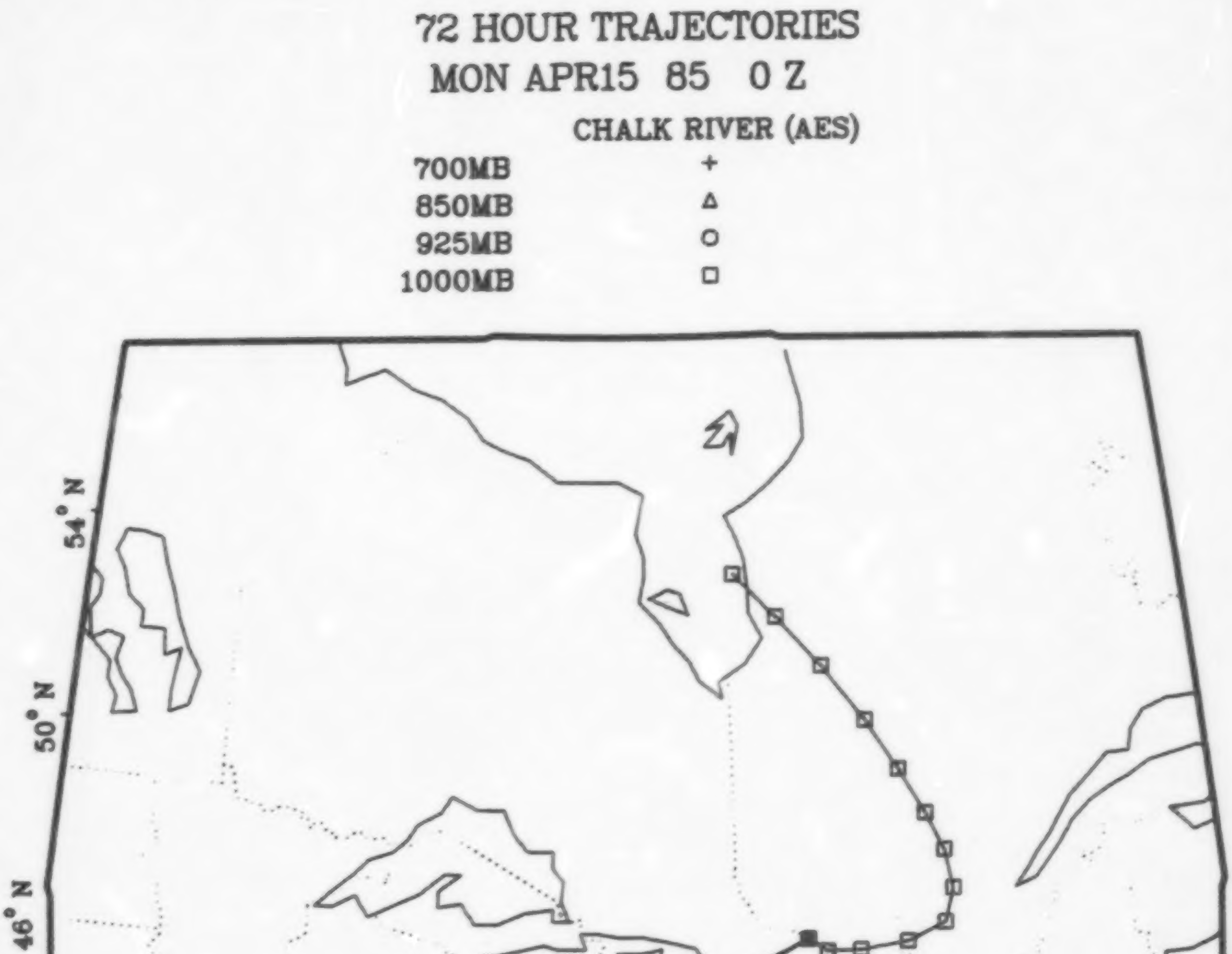
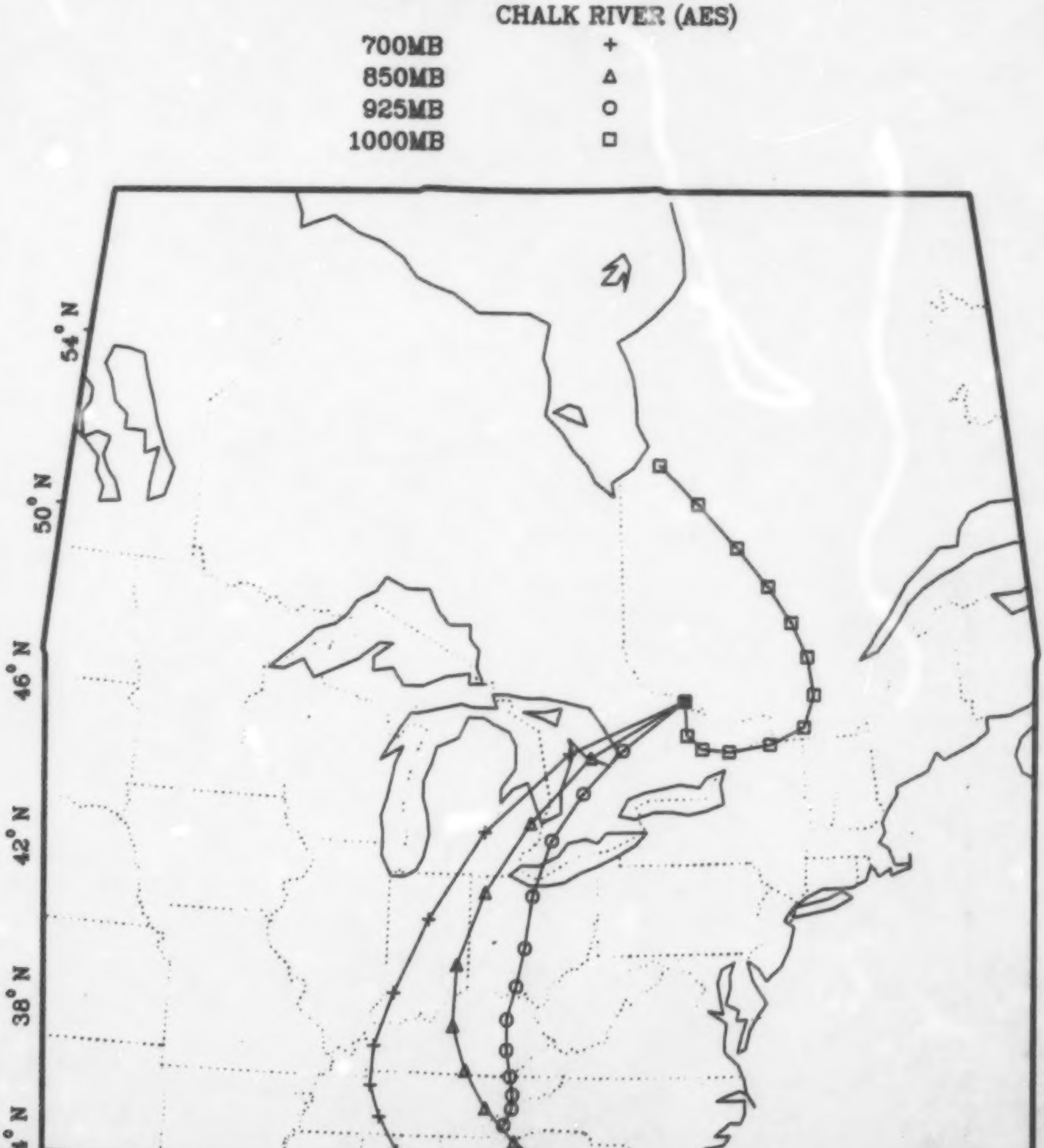

72 HOUR TRAJECTORIES
MON APR15 85 0 Z
CHALK RIVER (AES)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.8.6



72 HOUR TRAJECTORIES
MON APR15 85 6 Z

CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.8.7

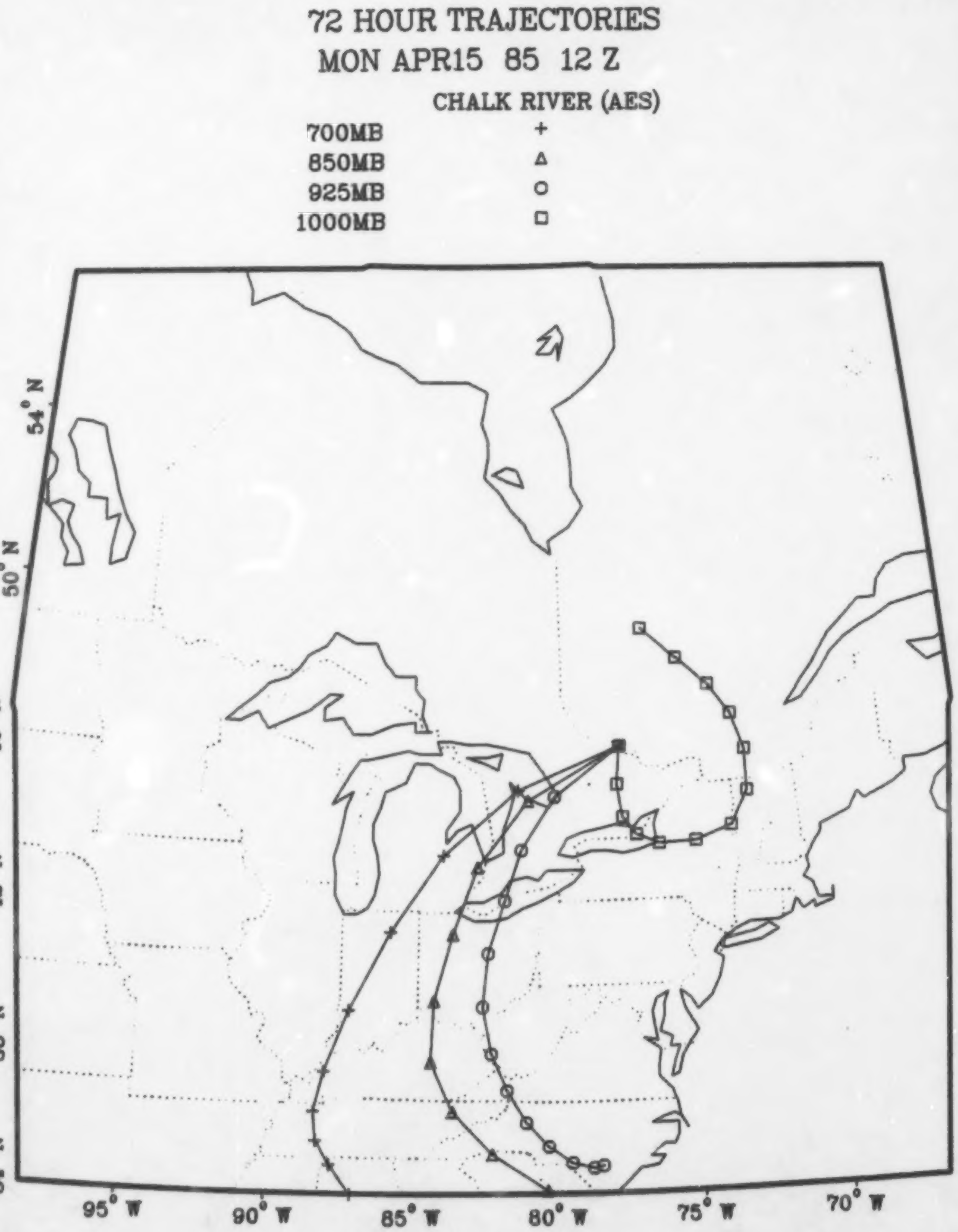

72 HOUR TRAJECTORIES
MON APR15 85 12 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.8.8

1.9 May 5-6, 1985, Dorset

This episode ranked 4th (4/8) and 5th (5/12) for $SO_4^=$ and NO_3^- wet deposition events respectively.

A low pressure centre, 1003 mb, on May 5, 1985, at 12Z, as shown in Fig. 1.9.1, associated with a frontal system such that the warm front laid over Dorset,was located over northern Michigan south of Sault Ste Marie. The system was associated with a large continuous precipitation area with Dorset situated in it.

Another stationary front associated with a low in saskatchewan and lying in northern ontario also influenced the weather at Dorset during this episode. Both systems moved slowly and by May 6, 1985, at 12Z, as shown in Fig. 1.9.2, the michigan low was located near Kingston with both fronts lying over southern Ontario. The michigan low had first moved eastward and then southward resulting in the warm front first moving north and then south of the station. This yielded light rain shower and rain as exhibited in Fig. 1.9.3. As the second front moved south of Dorset drizzle with light and very light intensity fell in the area as shown in this figure.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for May 5, at 12Z, 18Z and May 6, at 00Z, 06Z and 12Z are shown in Figures 1.9.4, 1.9.5, 1.9.6, 1.9.7 and 1.9.8 respectively.

Air parcels arriving at 1000 mb during this episode, as illustrated in Fig. 1.9.4-8, mostly came from Ontario and Quebec and did not pass over any high emission area and thus would not significantly contribute to pollution transport.

Air trajectories for 925 mb level show that SO_2 from the high emission areas in Ohio (Figures 1.9.5-8) and Toronto- Hamilton region could have been transported to Dorset during this episode. No transport from any highest emission area is observed at this level. Transport of NO_x from the high emission area in Ohio and moderate area in Toronto-Hamilton region was also probable.

Air parcels arriving at 850 mb level show that SO_2 from the highest emission area in Illinois, Chicago area (Fig 1.9.5) and Detroit area (see Fig. 1.9.7) and NO_x from the highest emission Chicago area (Fig. 1.9.5) and high emission Detroit (Fig. 1.9.7) and St. Louis, Missouri area could have been transported to Dorset. Transport of SO_2 from other high emission areas in Ohio, Indiana, Illinois, Missouri and Kansas was also exhibited.

Air trajectories for the 700 mb level show that SO_2 from the highest emission Sudbury area (see Figures 1.9.6 & 7) could have been transported to Dorset.

In summary, two warm frontal passages from slow moving systems yielded light rain/rain showers and light/very light drizzle for most of the duration during this episode. Low level (1000 mb & 925 mb) pollution transport does not seem important as no highest emission area is involved. High level (850 mb & 700 mb) transport of SO_2 and NO_x from the highest Chicago area and of SO_2 from Detroit, Sudbury and other areas in Illinois was probable during this episode.

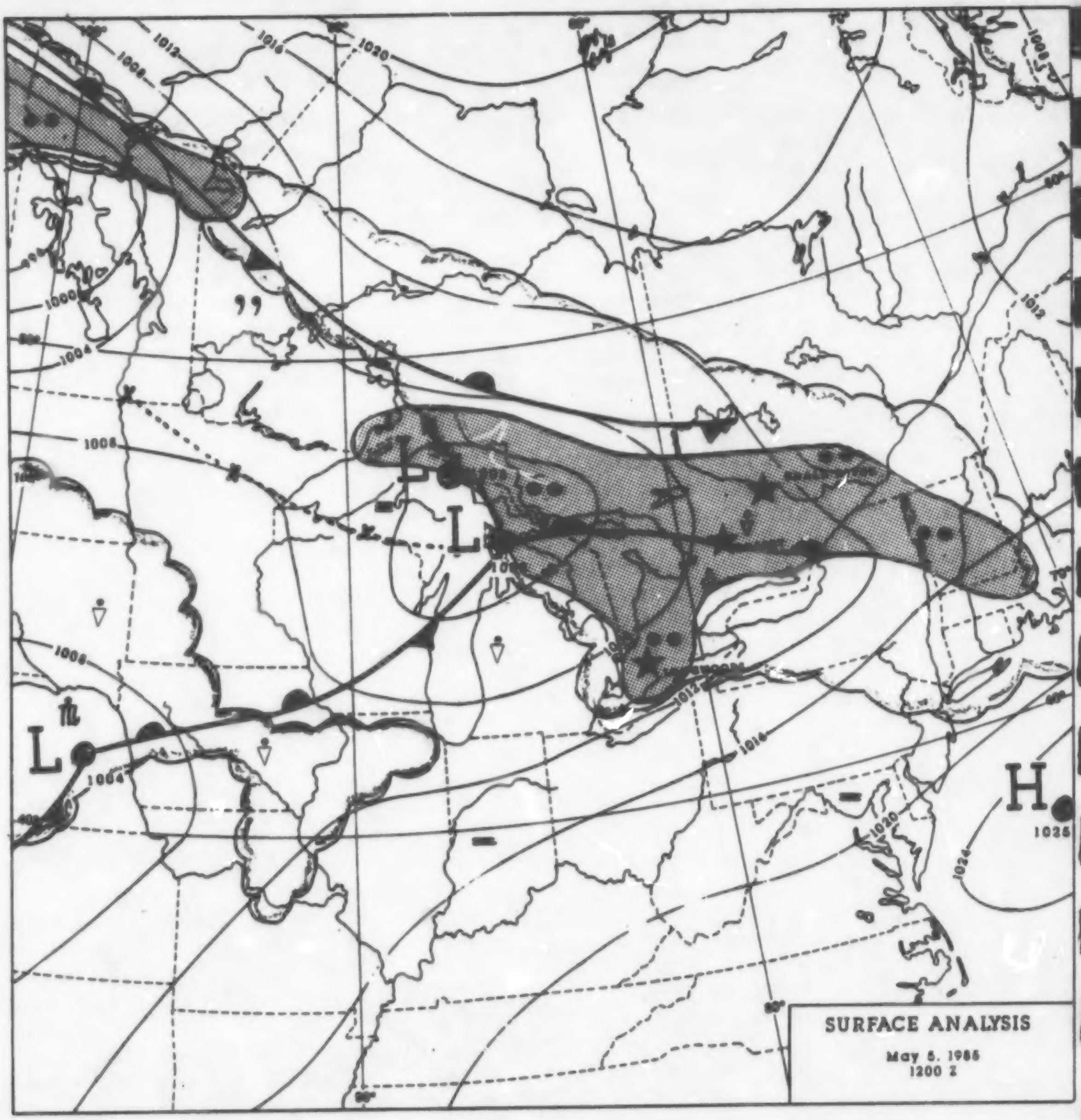

SURFACE ANALYSIS
May 5, 1985
1200 Z
1004
1008
1012
1016
1020
1024
1025
L
L
L
H

FIGURE 1.9.1

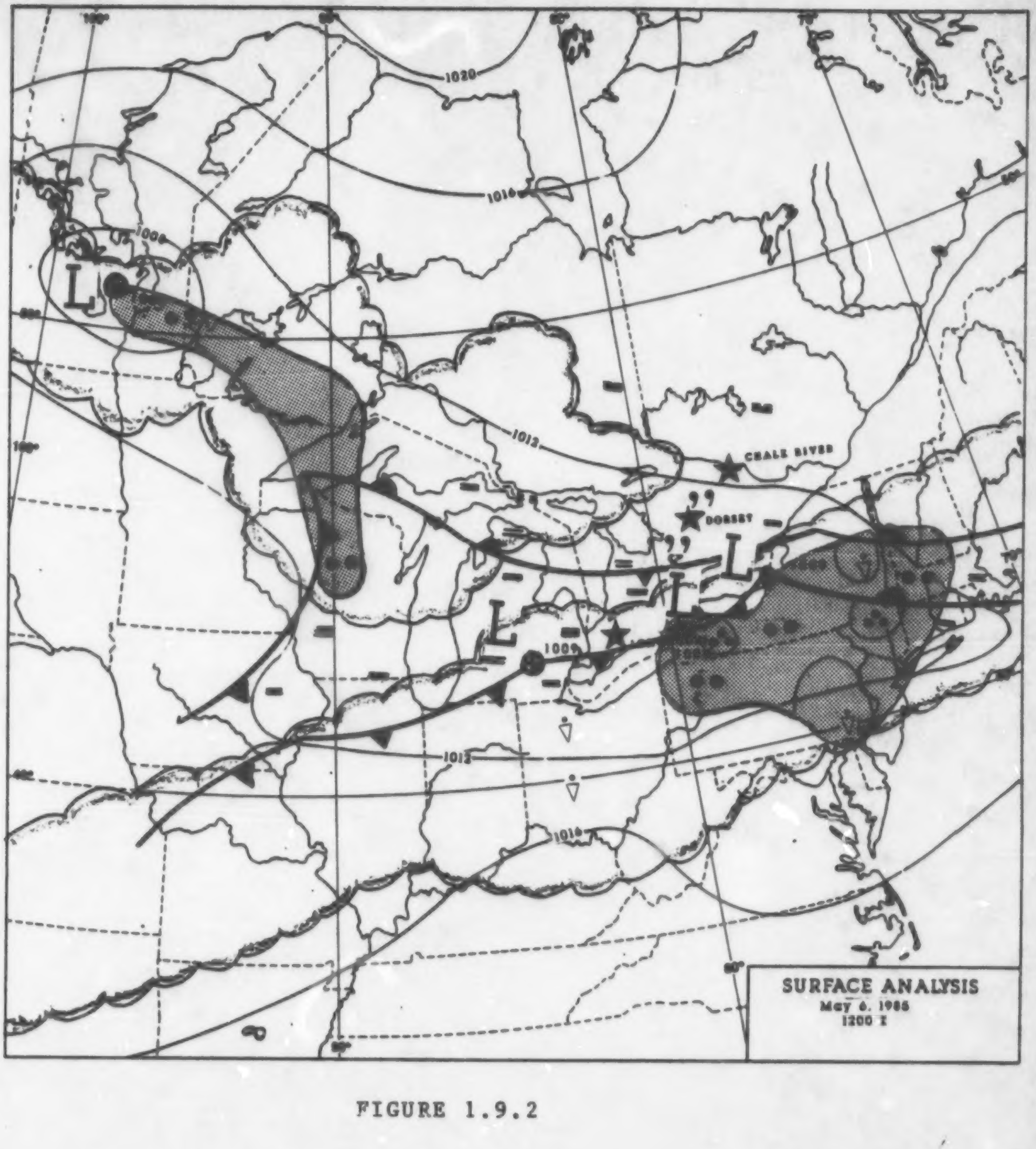
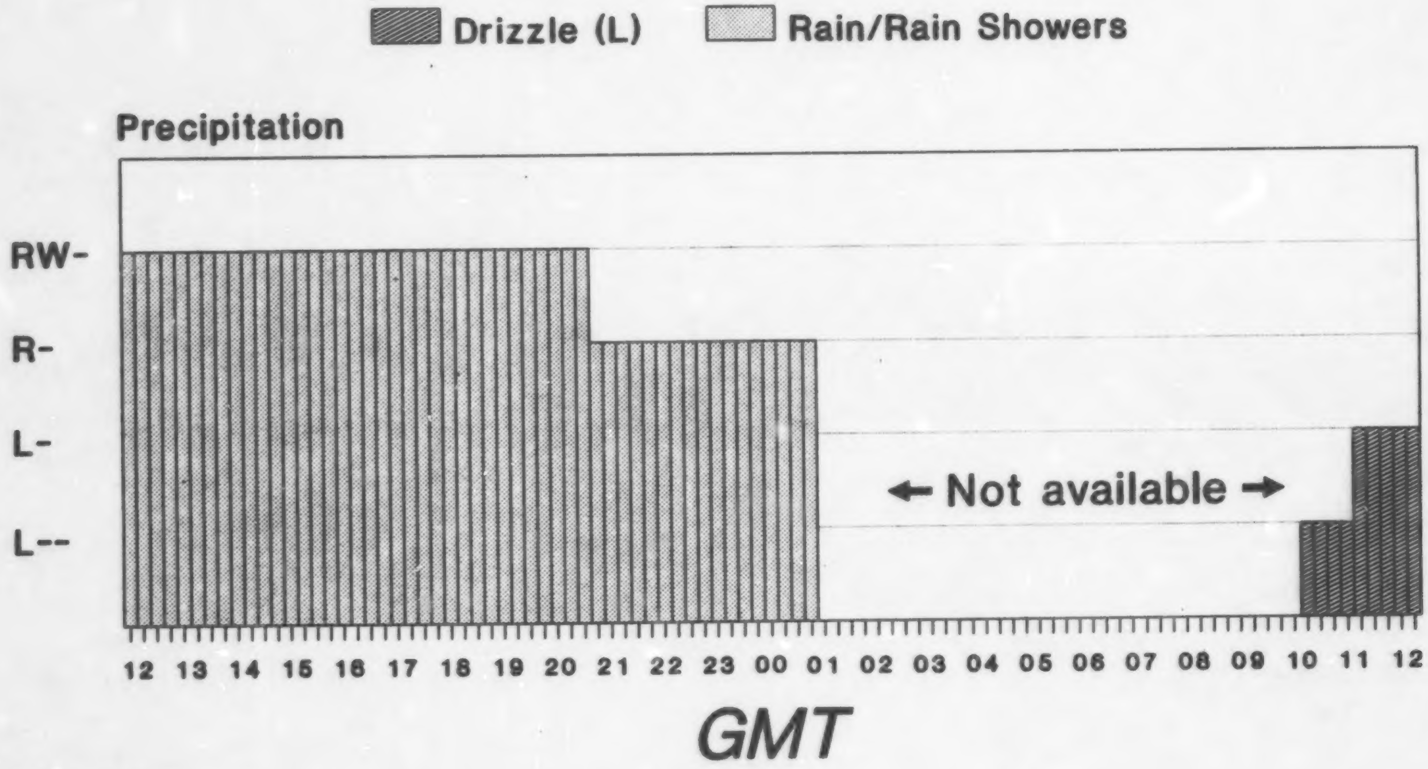

1020
1016
1008
1013
1009
1013
1016
L
L
L
L
CHALK RIVER
DORSET
SURFACE ANALYSIS
May 6, 1986
1200 Z

FIGURE 1.9.2

Muskoka A
May 5-6, 1985



R - Rain
RW - Rain Showers

FIGURE 1.9.3

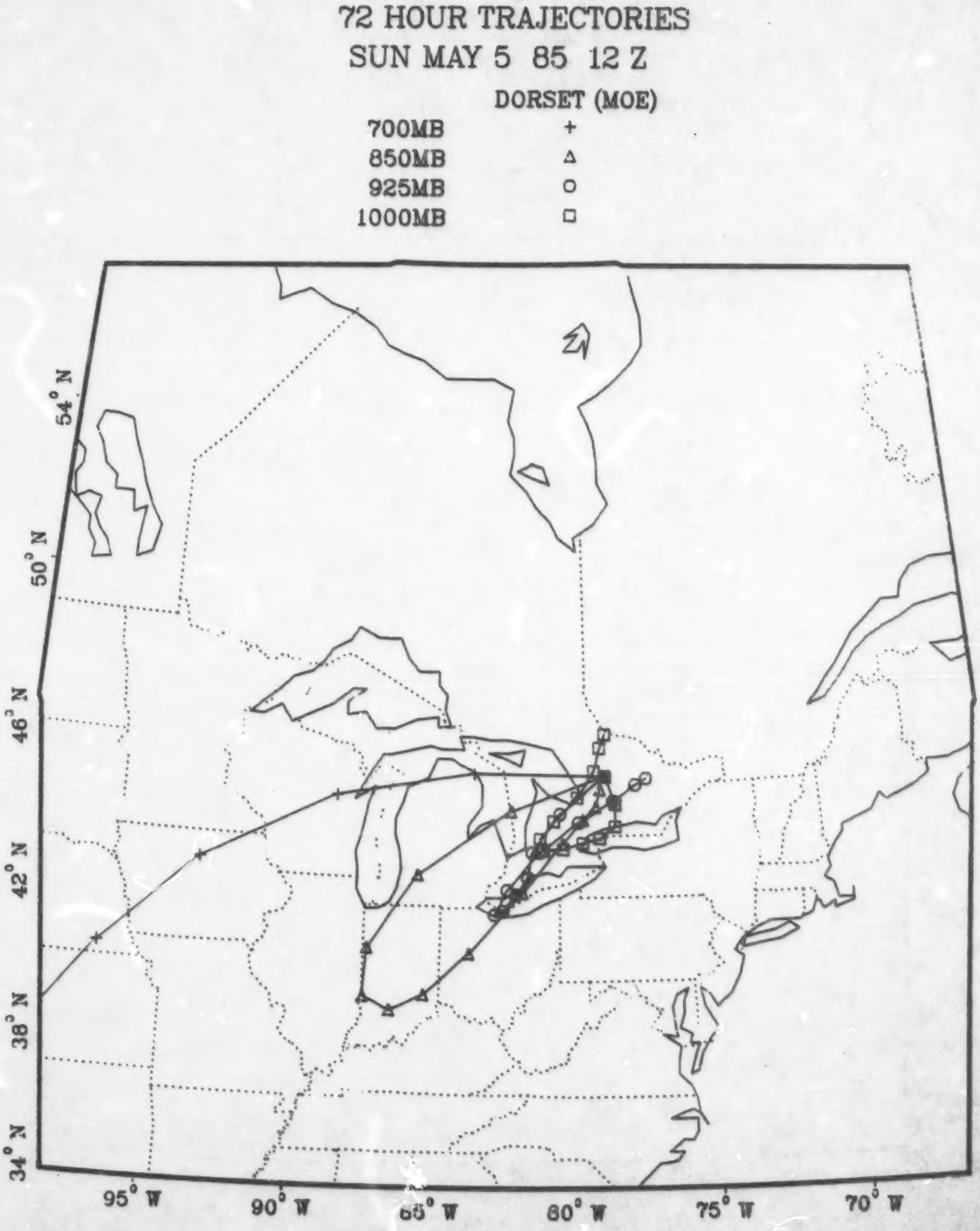
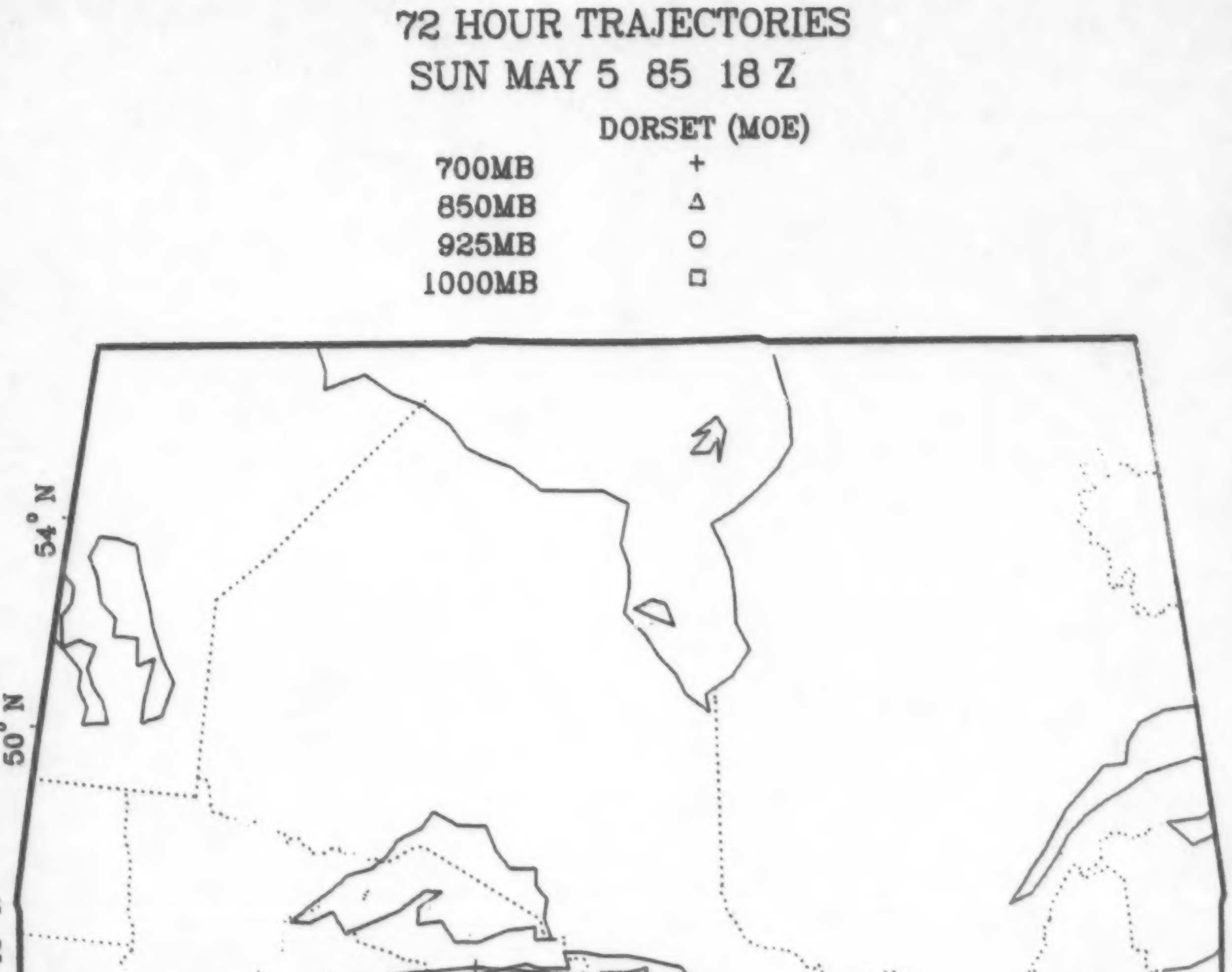

72 HOUR TRAJECTORIES
SUN MAY 5 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.9.4



72 HOUR TRAJECTORIES
SUN MAY 5 85 18 Z

DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.9.5

72 HOUR TRAJECTORIES
MON MAY 6 85 0 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

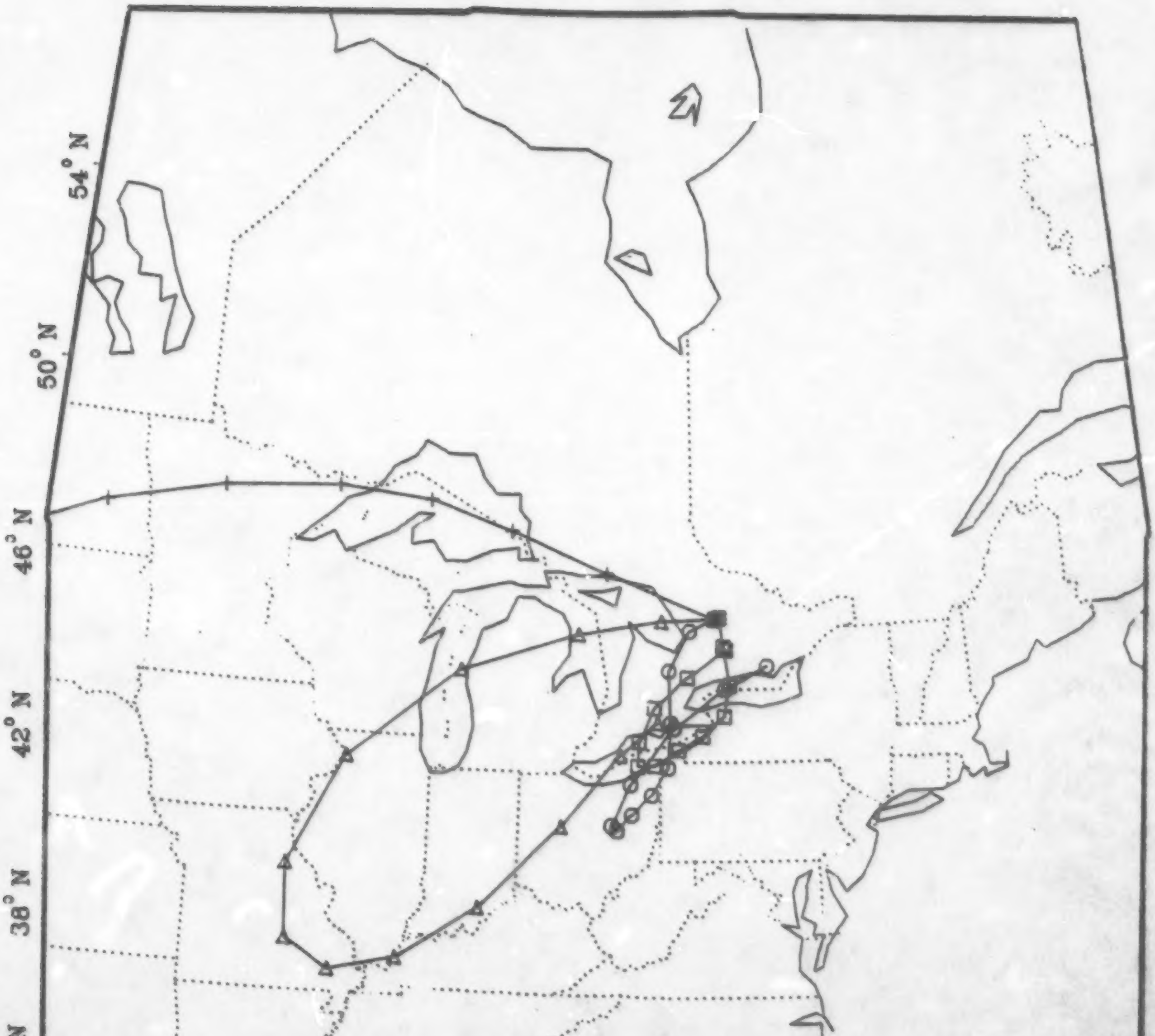

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.9.6

72 HOUR TRAJECTORIES
MON MAY 6 85 6 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

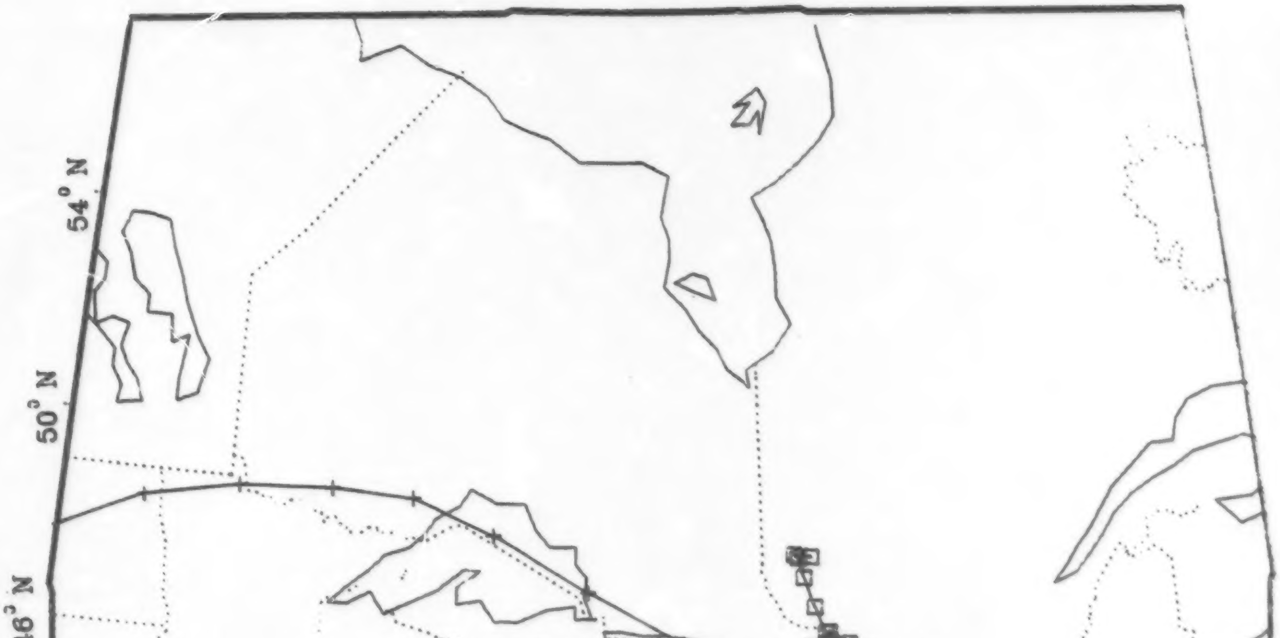

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.9.7

72 HOUR TRAJECTORIES
MON MAY 6 85 12 Z

DORSET (MOE)

700MB +
850MB ∆
925MB ○
1000MB □

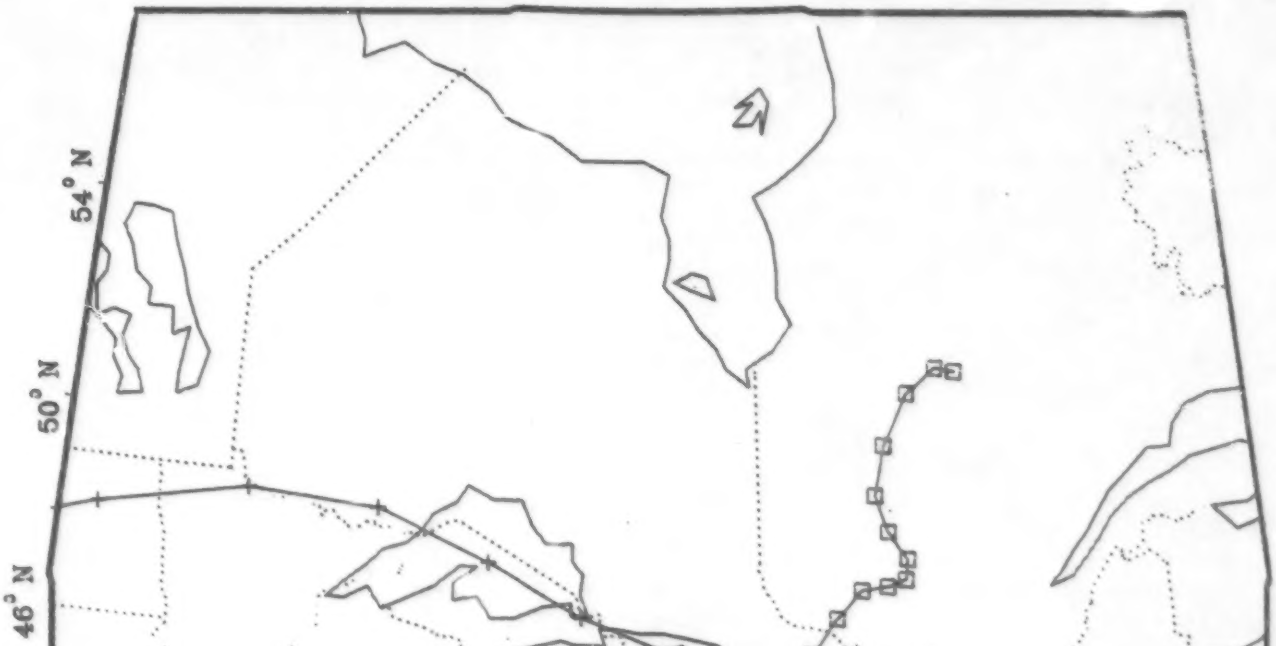

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.9.8

1.10 May 15-16, 1985. Dorset

This ranked 8th (8/12) and 4th (4/10) for NO_3^- and H^+ wet deposition events, respectively.

On May 15, at 12Z, as shown in Fig. 1.10.1, a low pressure centre of 1000 mb near Minneapolis, Minnesota and a wave with frontal systems and a trowl were analyzed. As this system moved, the warm front approached Dorset but did not pass over it. On May 16, at 12Z, a low pressure centre of 1003 mb near Sudbury and a trowl passing over the station were observed as exhibited in Fig. 1.10.2. Light and very light rain showers fell, as shown in Fig. 1.10.3., for a few hours as the warm front approached the station.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for May 15, at 12Z, 18Z and May 16, at 00Z, 06Z and 12Z are shown in Figures 1.10.4, 1.10.5, 1.10.6, 1.10.7 and 1.10.8 respectively.

Air parcels arriving at 1000 mb level, as shown in Figures 1.10.4-8, did not pass over any highest or high NO_x emission area and thus transport at this level was minimal.

Air trajectories at 925 mb level also did not cross over any highest NO_x emission area. However, transport from moderate Toronto-Hamilton area (see Figures 1.10.5-7) and high Detroit area (Fig. 1.10.8) was probable.

Air trajectories arriving at 850 mb level show that NO_x transport from the highest emission Chicago area between May 15, 18Z and May 16, 00Z (see Figures 1.10.5-6)and high Detroit area (Fig. 1.10.5) on May 15, at 18Z could have taken place.

Air parcels arriving at 700 mb level could have carried NO_x from the highest emission Chicago area on May 15, at 12Z, as shown in Fig. 1.10.4, and high emission Detroit area at 18Z (Fig. 1.10.5).

In summary, warm front induced rain showers occurred for a few hours at Dorset. High level (850mb & 700 mb) transport of NO_x from the highest emission Chicago area and low level (925 mb) and high level transport from high emission Detroit area seem to be important during this episode.

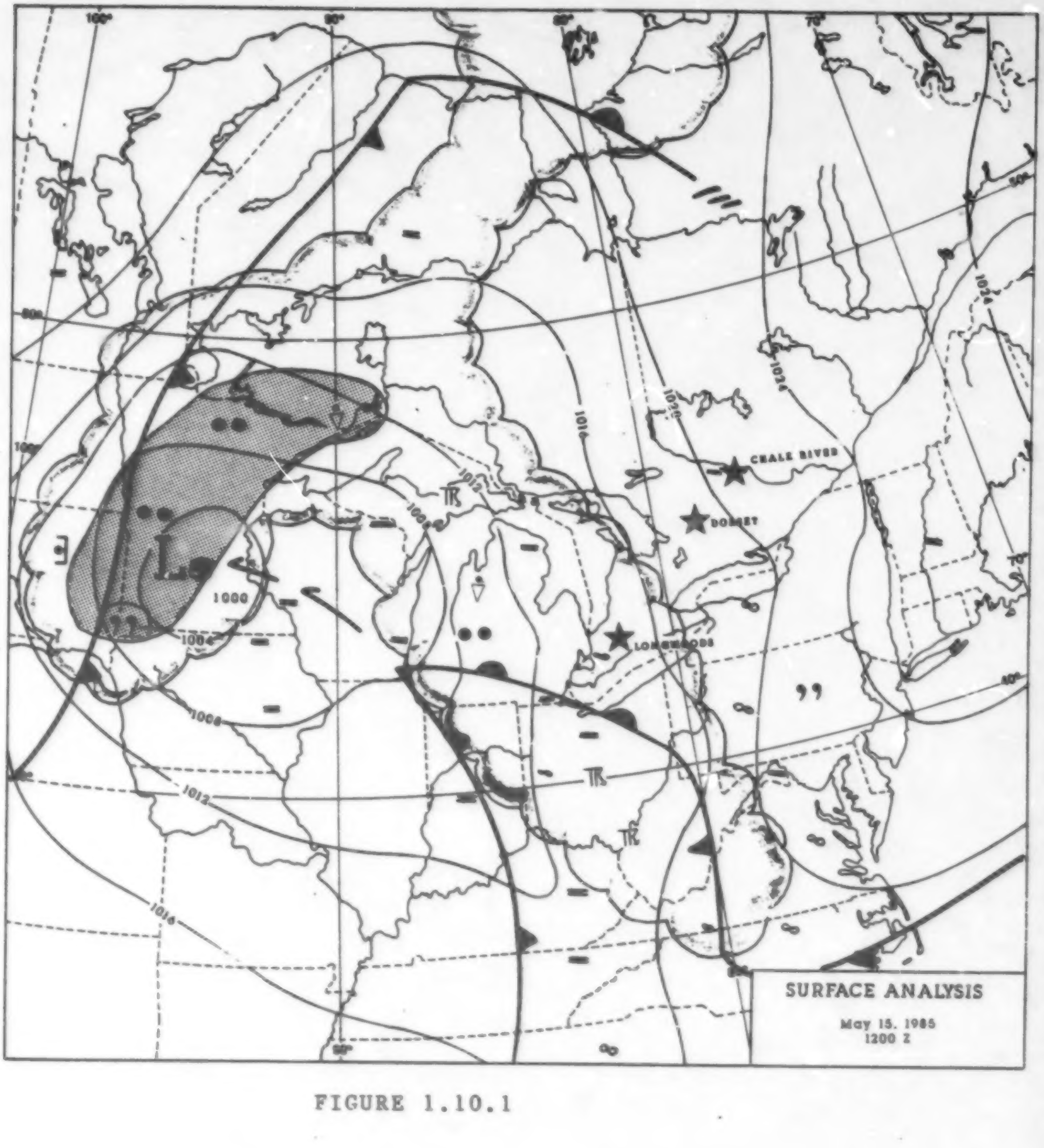

100°
90°
80°
70°
50°
40°
L
1000
1004
1008
1012
1016
1020
1024
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
May 15, 1985
1200 Z

FIGURE 1.10.1

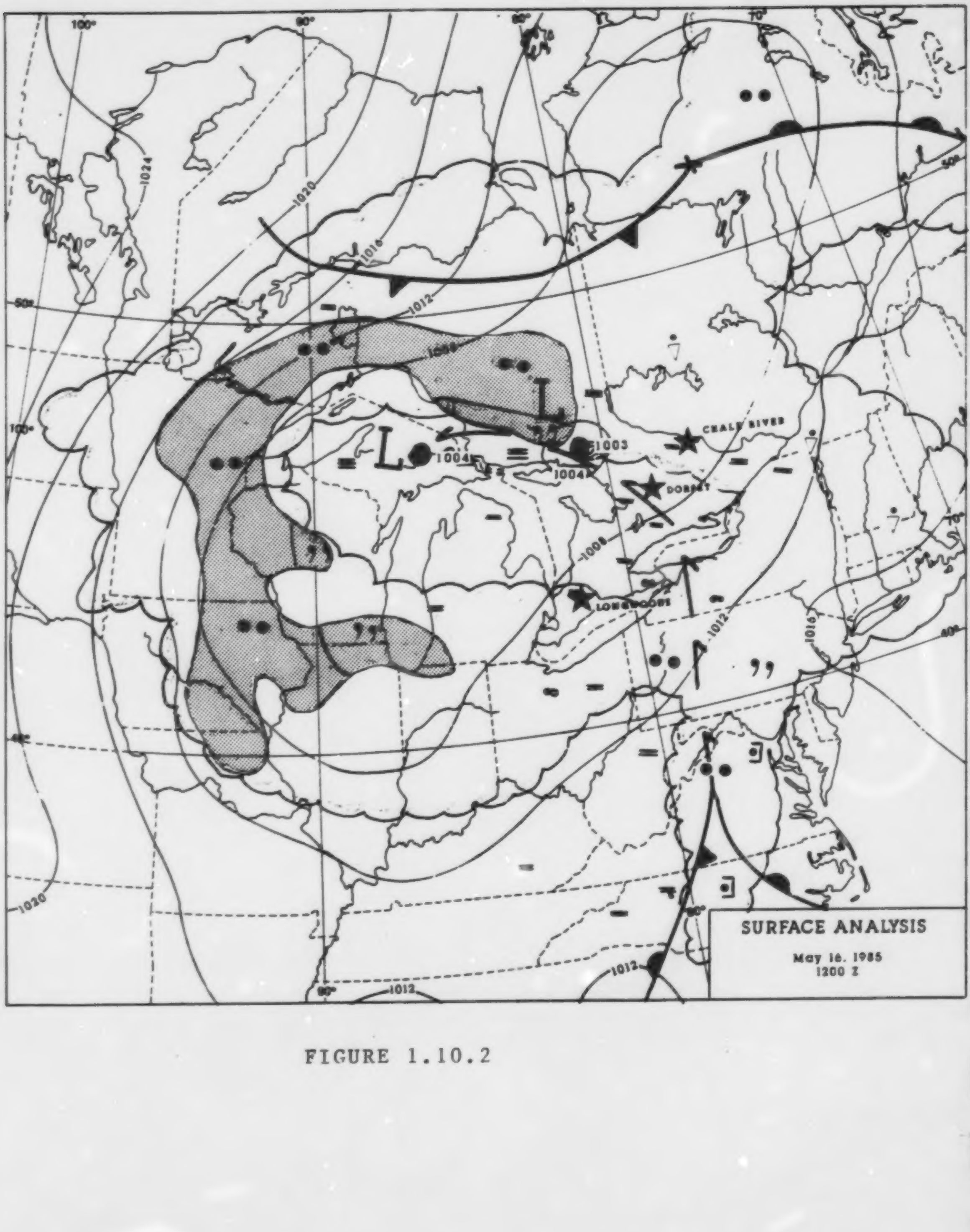

100°
90°
80°
70°
50°
40°
1024
1020
1016
1012
1008
1004
1003
L
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
May 16, 1985
1200 Z

FIGURE 1.10.2

Muskoka A

May 15-16, 1985

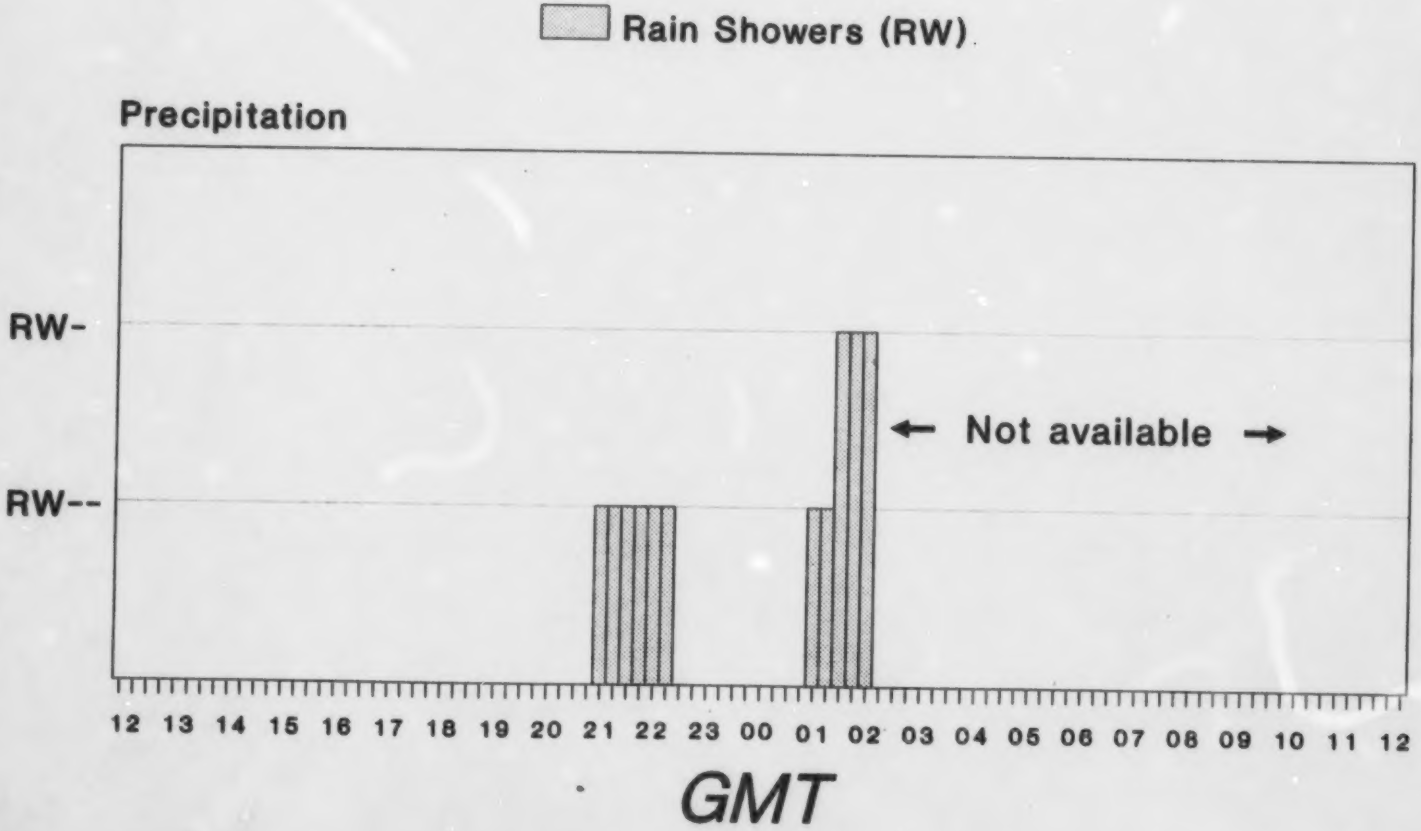


FIGURE 1.10.3

72 HOUR TRAJECTORIES
WED MAY15 85 12 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

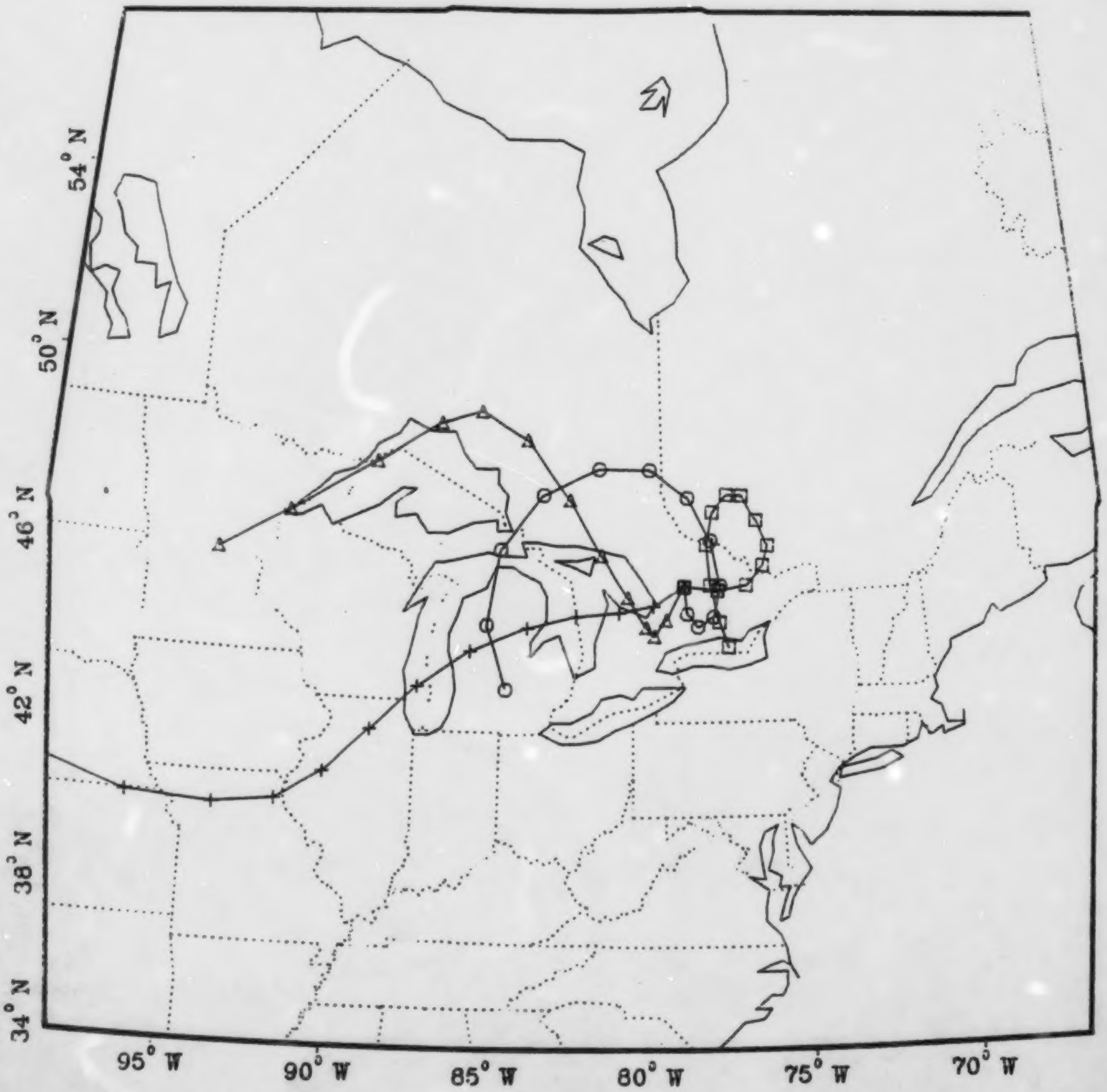

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.10.4

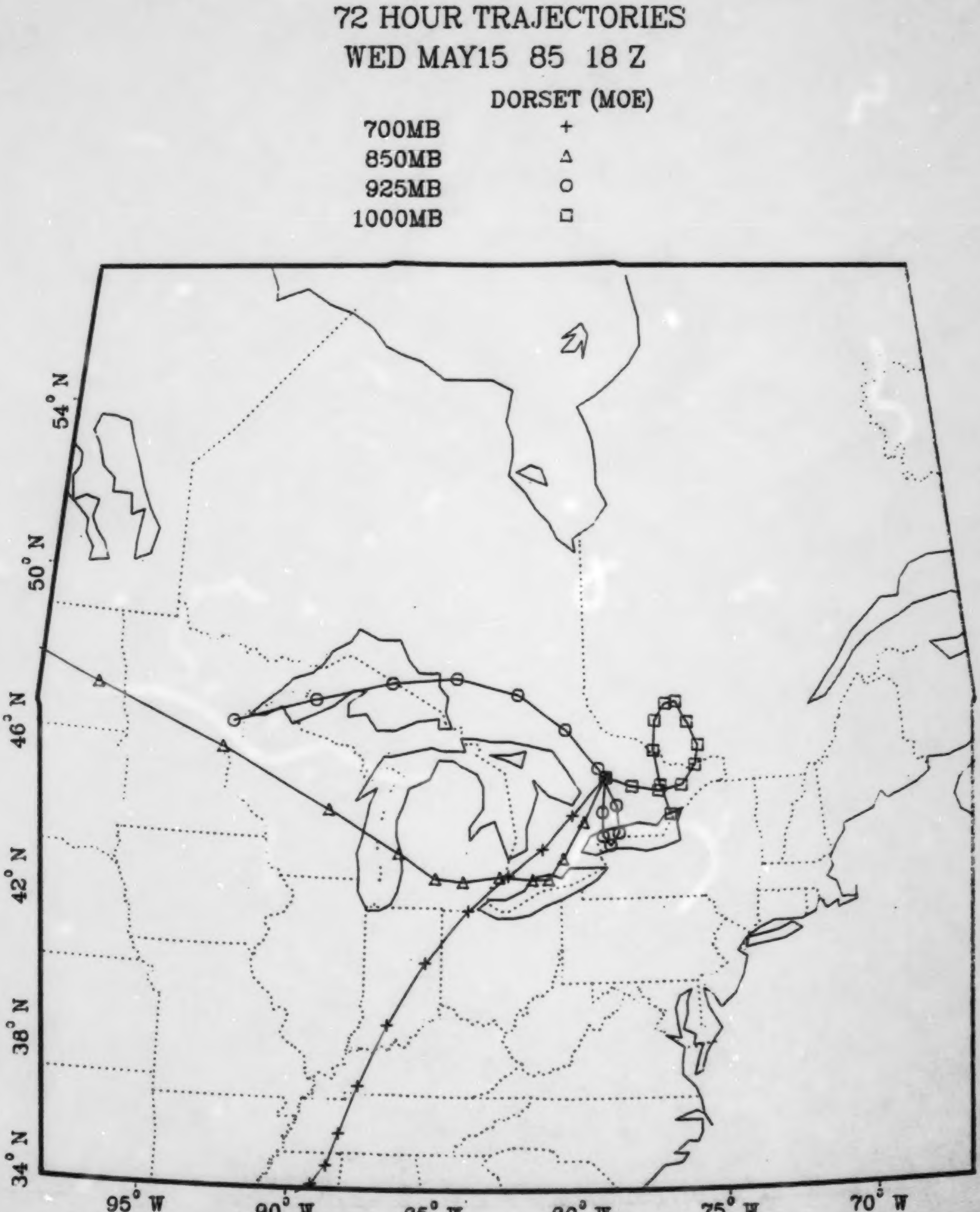

72 HOUR TRAJECTORIES
WED MAY15 85 18 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.10.5

72 HOUR TRAJECTORIES
THU MAY16 85 0 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

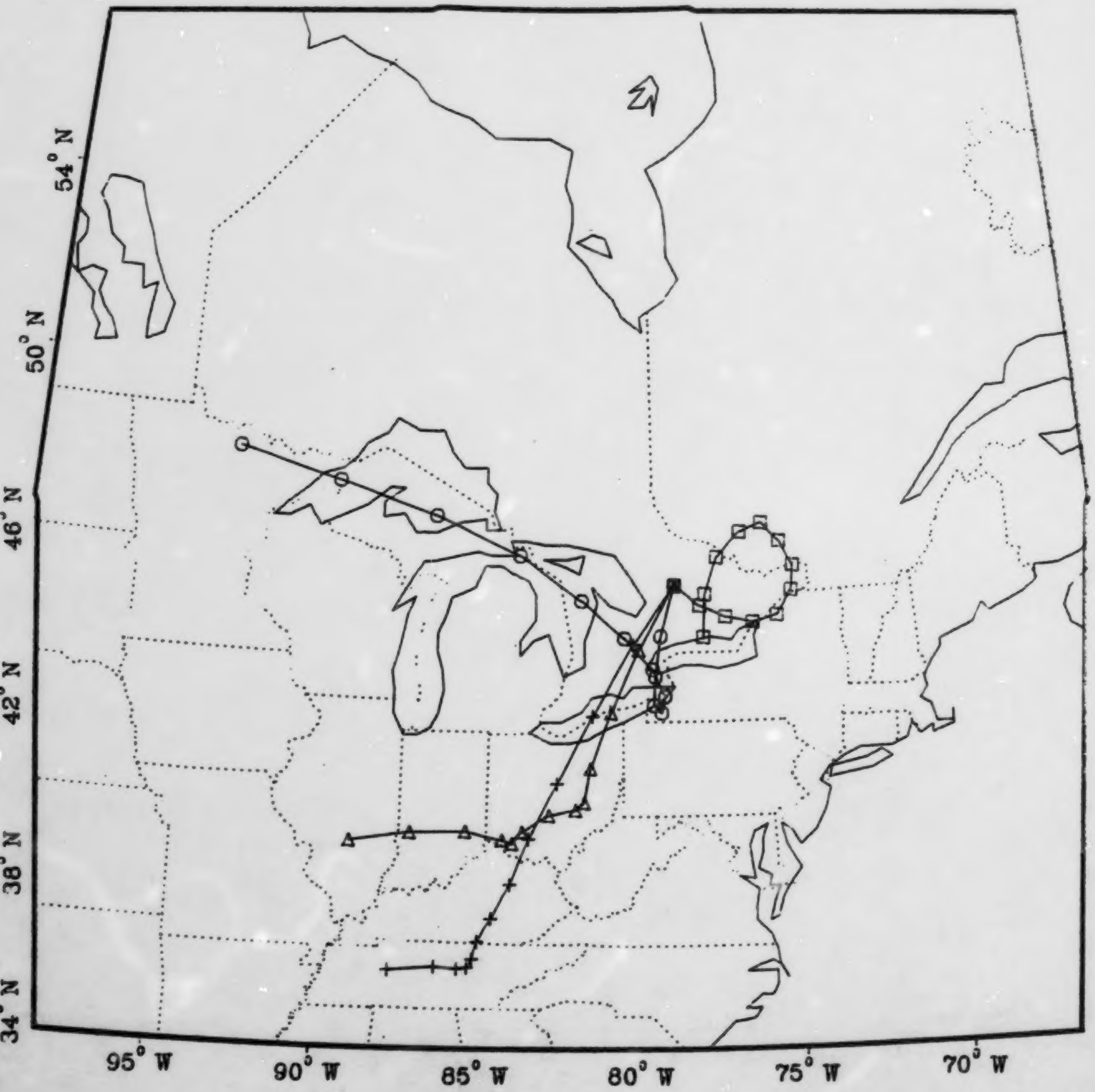

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.10.6

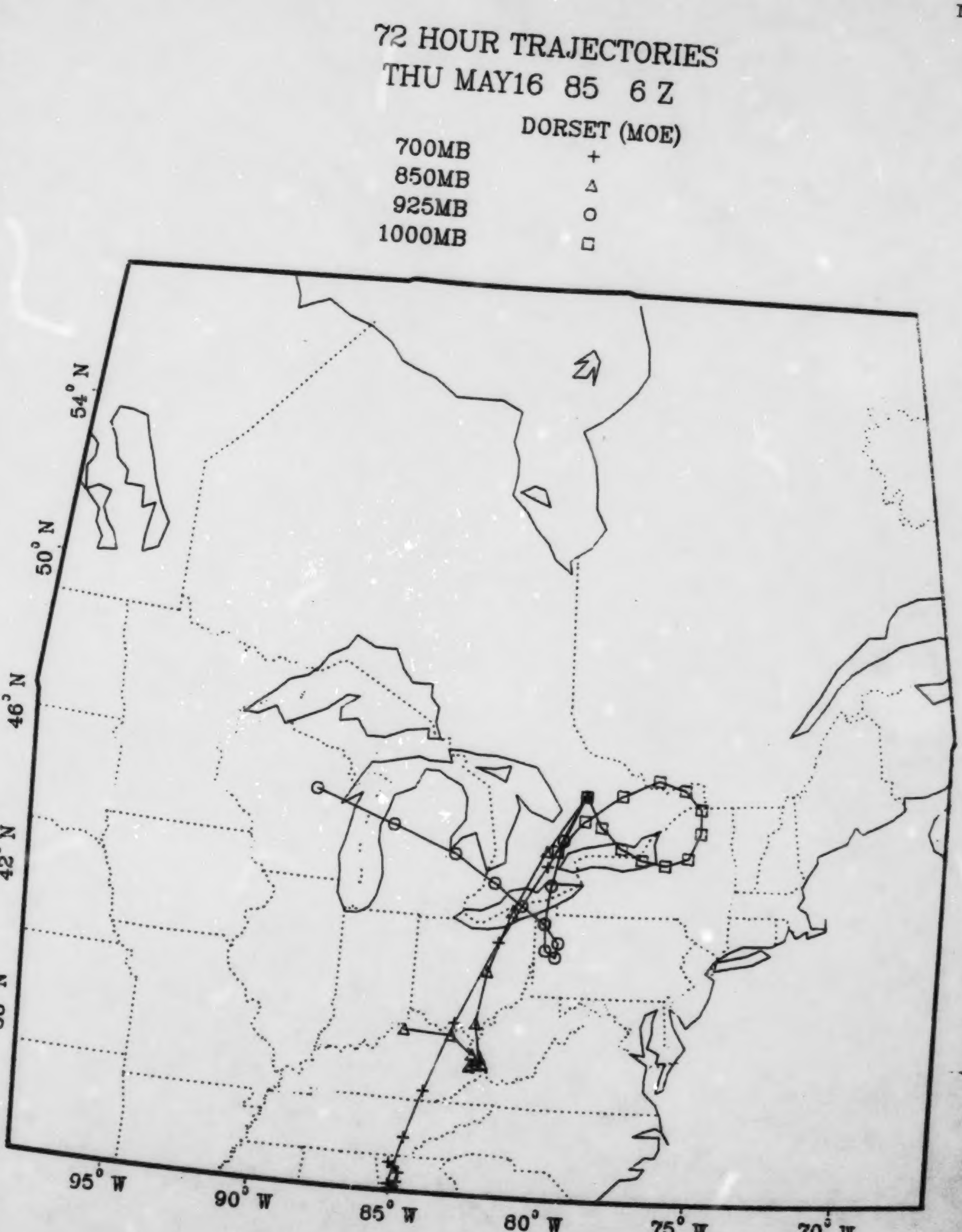
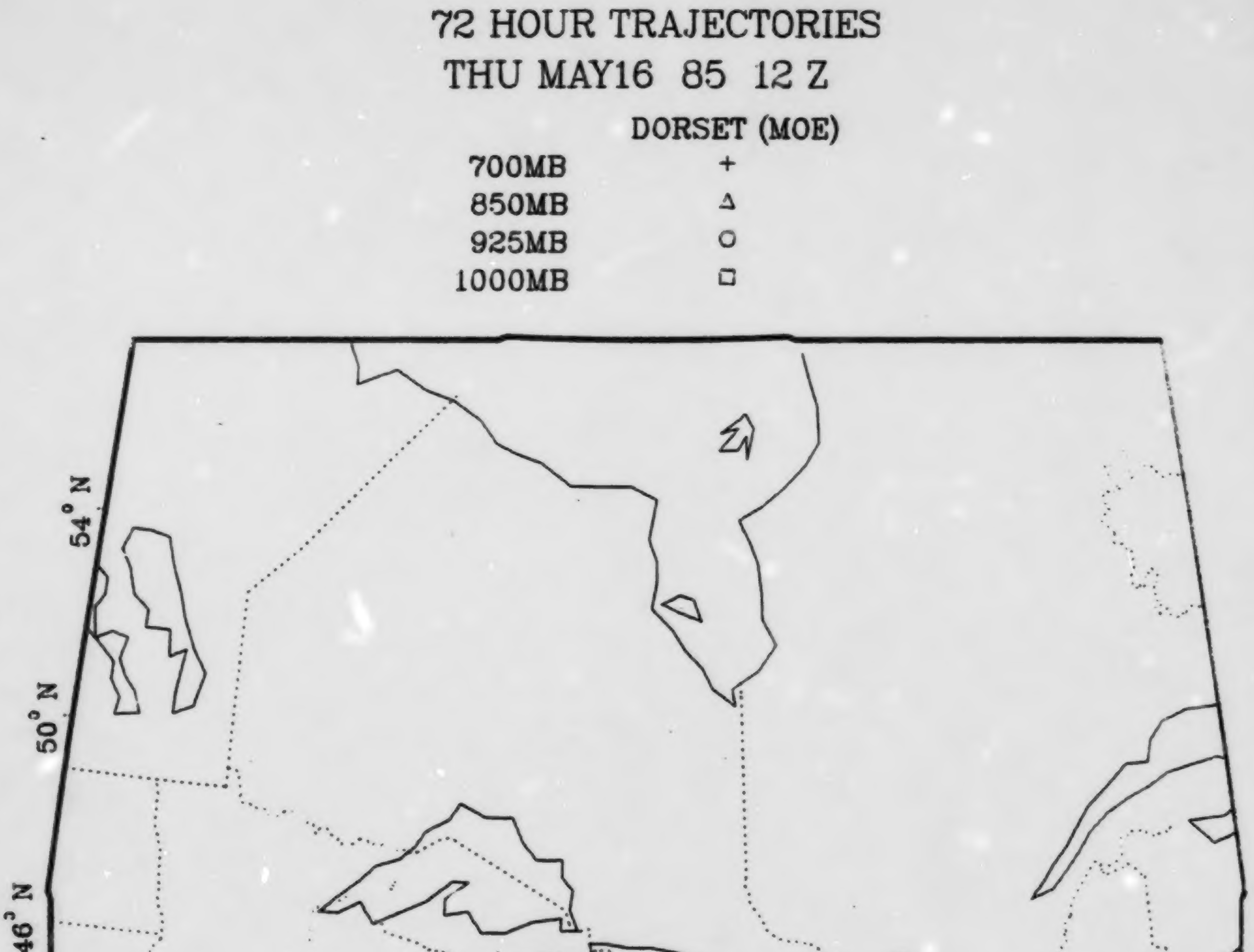

72 HOUR TRAJECTORIES
THU MAY16 85 6 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.10.7



72 HOUR TRAJECTORIES
THU MAY16 85 12 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.10.8

1.11 May 26-27, 1985, Longwoods(AES)

This episode ranked 8th (8/10) for only NO_3^- wet deposition events.

The synoptic conditions on May 26, at 12Z, were such that a cold front lay over Longwoods as shown in Fig. 1.11.1 in an east west direction. This front first moved northward and then southward to lie in an SW-NE orientation over Longwoods on May 27, at 12Z, as illustrated in Fig. 1.11.2. This slow moving system was responsible for a front lying in the region throughout the episode and yielded showery weather as shown in Fig. 1.11.3. Rain showers, thunder showers and lightning were observed as shown in the figure.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for May 26, at 12Z, 18Z and May 27, at 00Z, 06Z and 12Z are shown in Figures 1.11.4, 1.11.5, 1.11.6, 1.11.7 and 1.11.8 respectively.

Air parcels arriving at 1000 mb level show that NO_x from high emission Detroit area (see Figures 1.11.4-5) and Cleveland, Ohio area(Figures 1.11.6-8) could have been transported to Longwoods at this level.

Air trajectories at 925 mb level show that NO_x from the highest emission Chicago area (Fig. 1.11.4) and high emission Detroit area (Fig 1.11.4-6) could have been transported to Longwoods.

Air parcels arriving at 850 mb level could have carried NO_x from the highest emission Chicago area for most of the time as shown in Figures 1.11.4-5 & 7-8 , and high emission St. Louis area (Figures 1.11.5-6).

Air trajectories at 700 mb level do not pass over significant NO_x emission areas and thus pollution transport at this level was likely to be minimal.

Summarizing, cold front passages yielded rain showers and thunder showers intermittently throughout the episode. High level transport at 850 mb level and low level transport at 925 mb level of NO_x from the highest emission Chicago area appear to be most important. Low level transport from high emission Cleveland, Ohio, and Detroit, Michigan, area as well as high level transport from St. Louis, Missouri area were also likely.

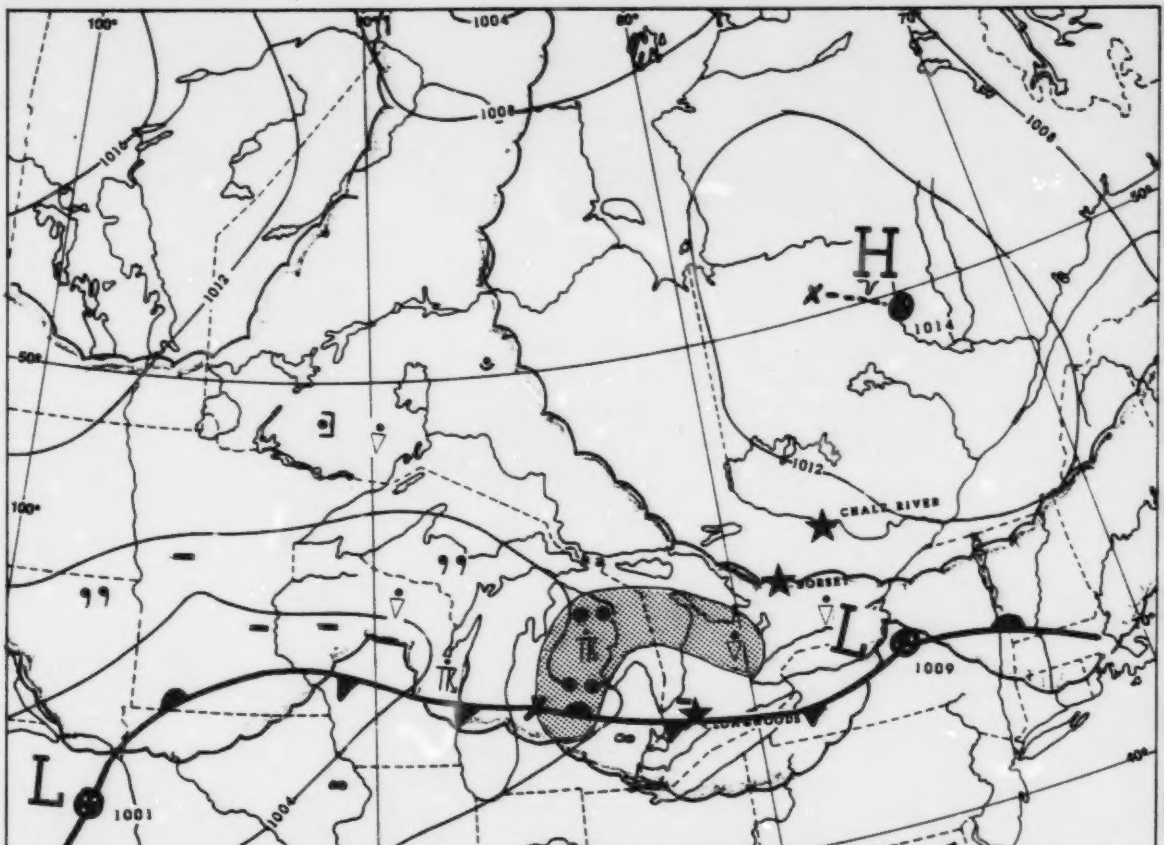

SURFACE ANALYSIS
May 26, 1985
1200 Z
H
L
L
-H
1014
1009
1001
1016
1004
1008
1012
1016
CHALK RIVER
DORSET
LONGWOODS
100°
90°
80°
70°
50°
40°

FIGURE 1.11.1

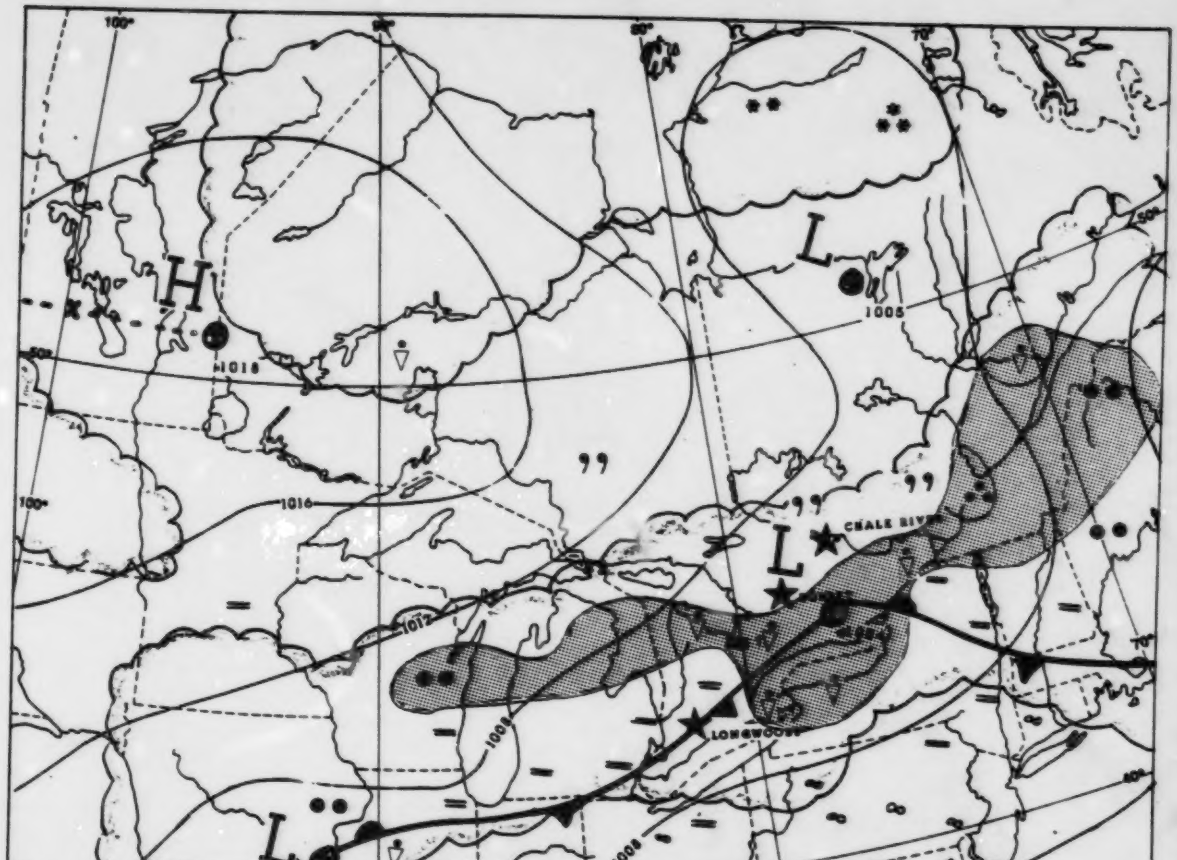
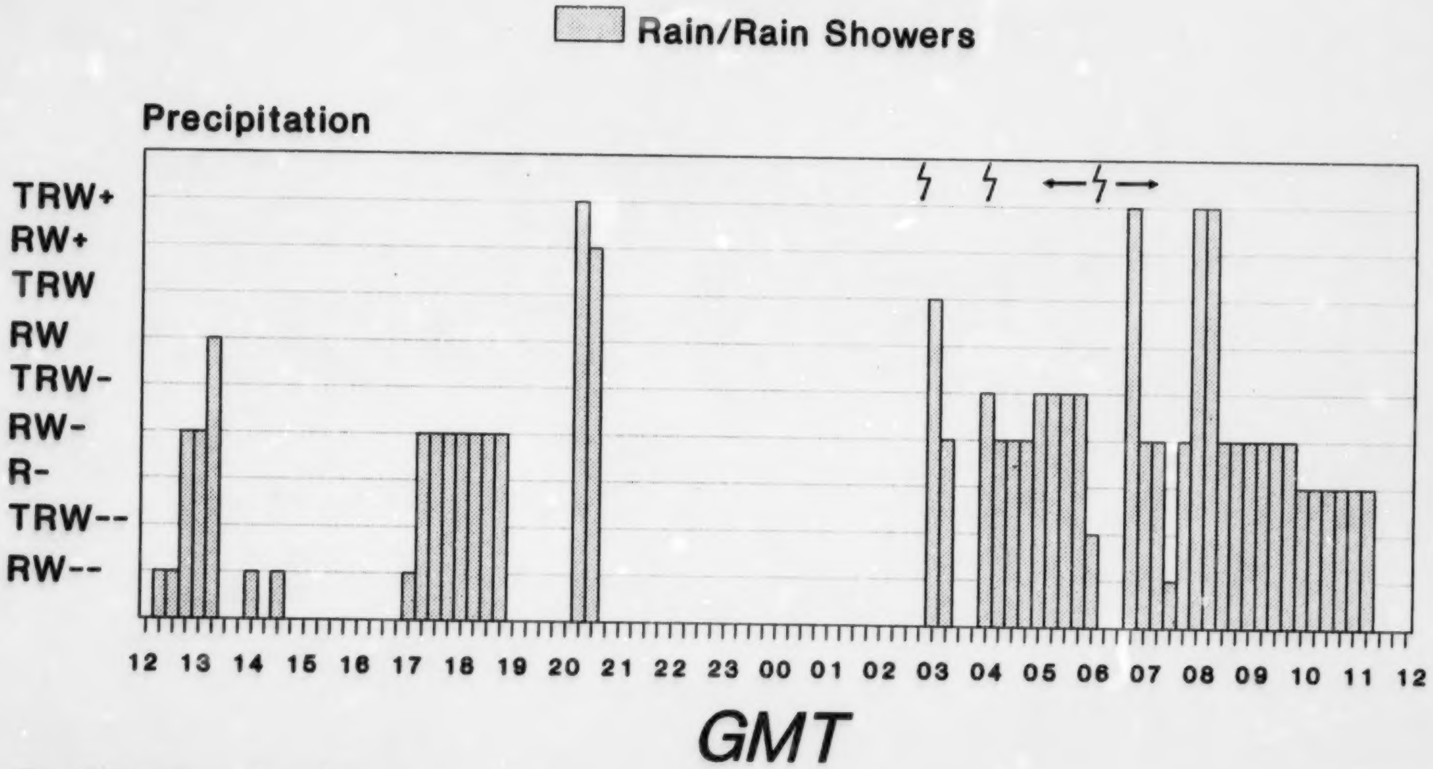

SURFACE ANALYSIS
May 27, 1985
1200 Z
H
L
L
L
1018
1016
1012
1008
1004
1005
1008
1012
CHALK RIVER
LONGWOOD
100°
90°
80°
70°
50°
40°

FIGURE 1.11.2

London A
May 26-27, 1985



R - Rain, T - Thunder
RW - Rain Showers

FIGURE 1.11.3

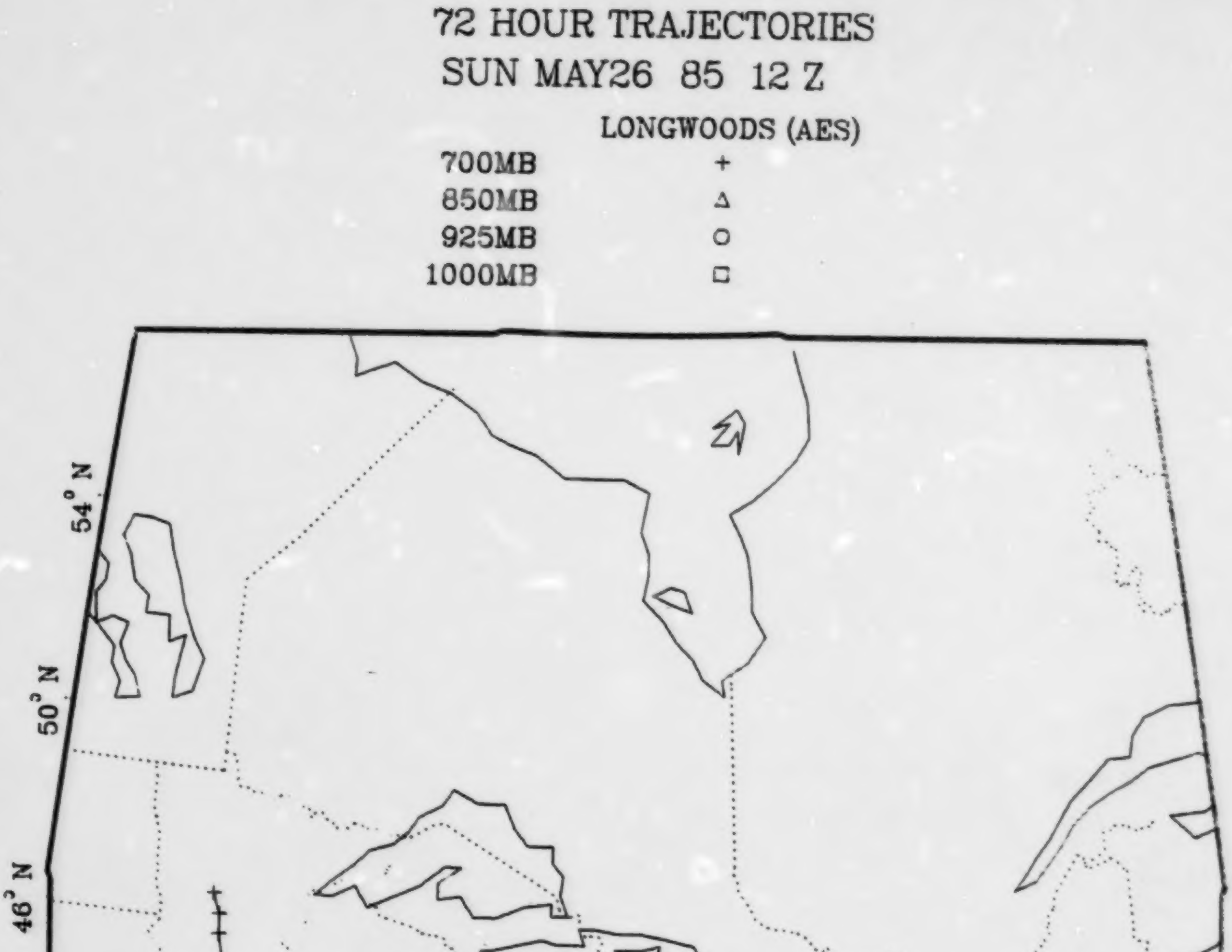

72 HOUR TRAJECTORIES
SUN MAY26 85 12 Z
LONGWOODS (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.11.4

72 HOUR TRAJECTORIES
SUN MAY26 85 18 Z

LONGWOODS (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

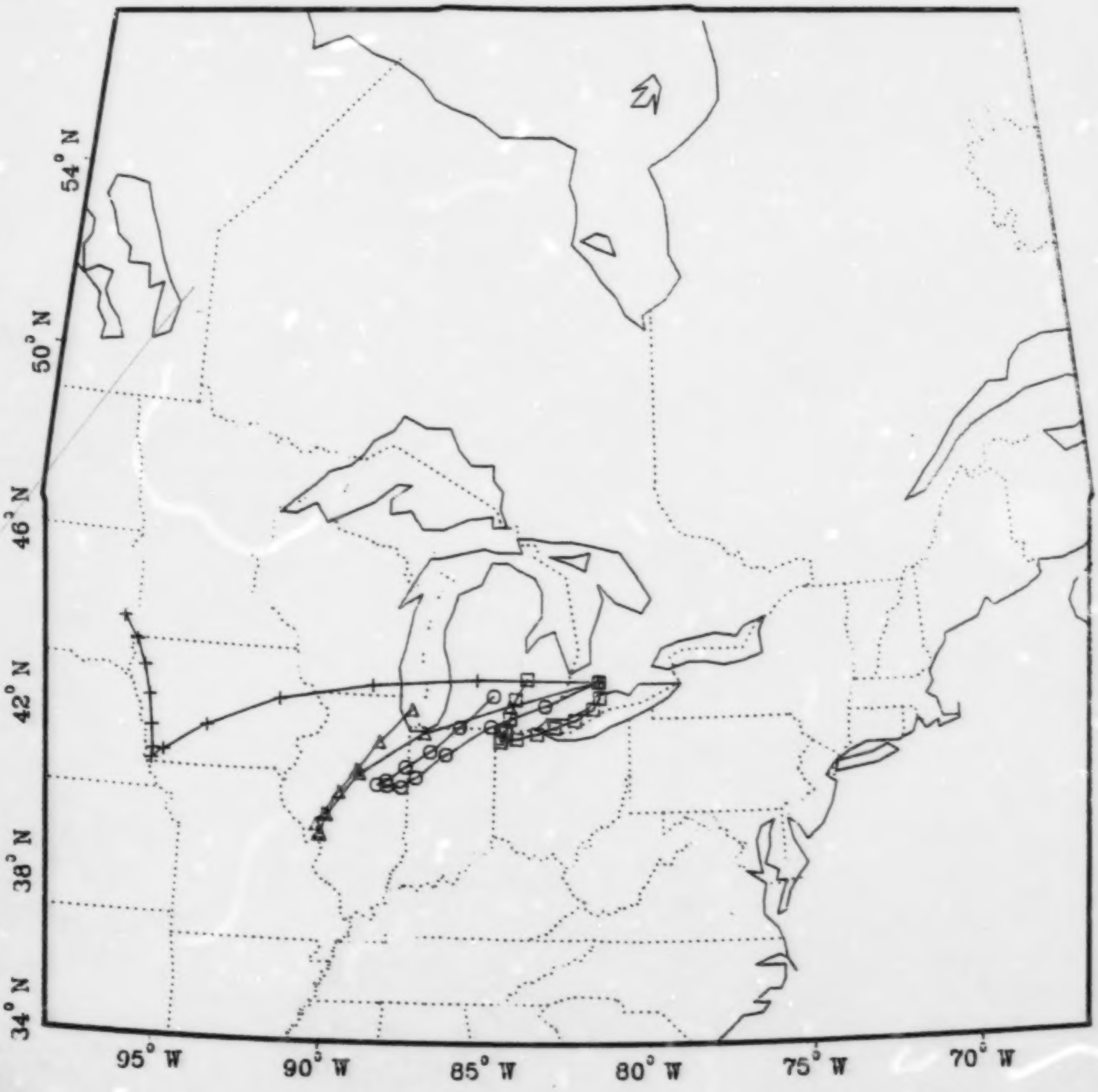

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.11.5

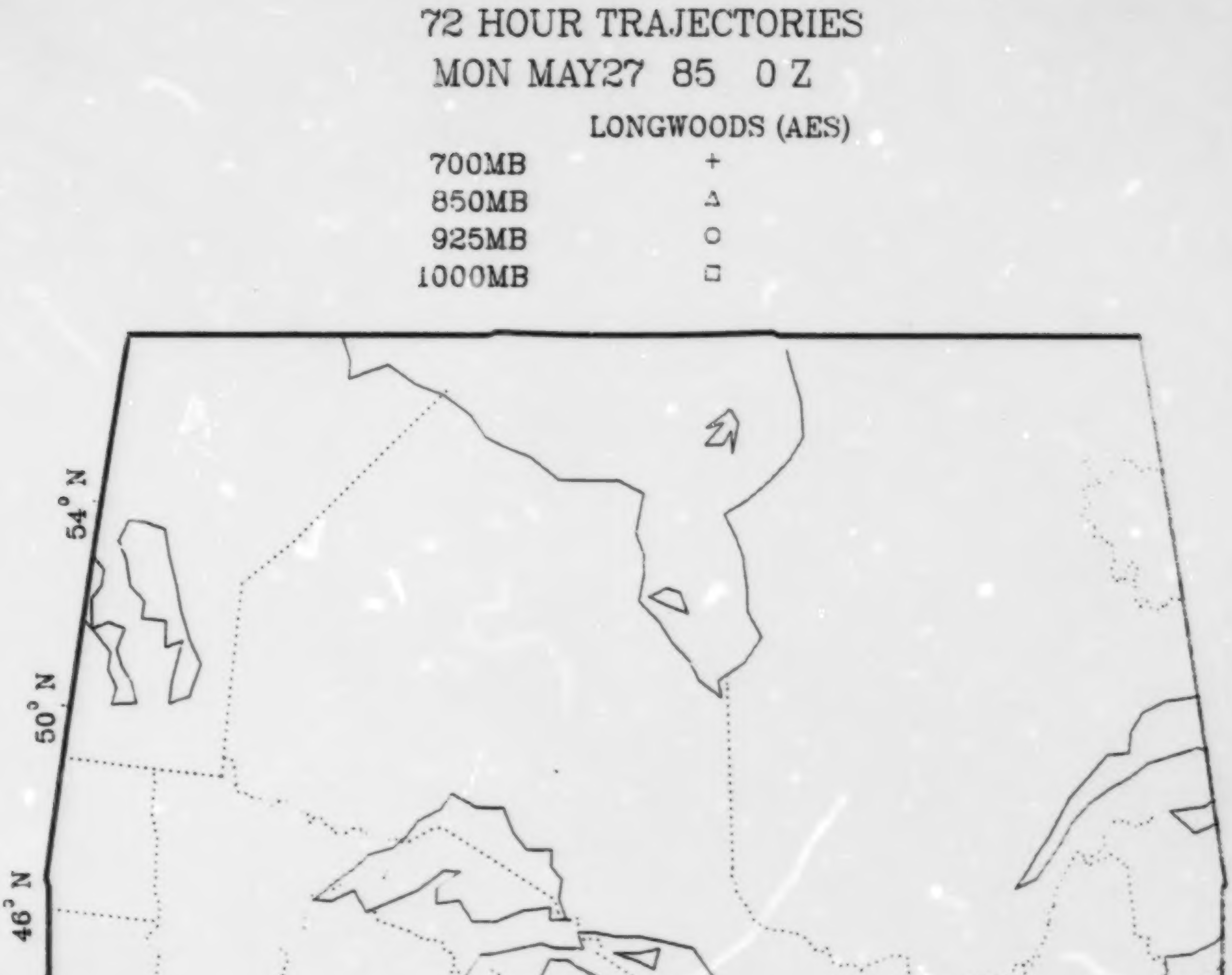

72 HOUR TRAJECTORIES
MON MAY27 85 0 Z
LONGWOODS (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.11.6

72 HOUR TRAJECTORIES
MON MAY27 85 6 Z

LONGWOODS (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

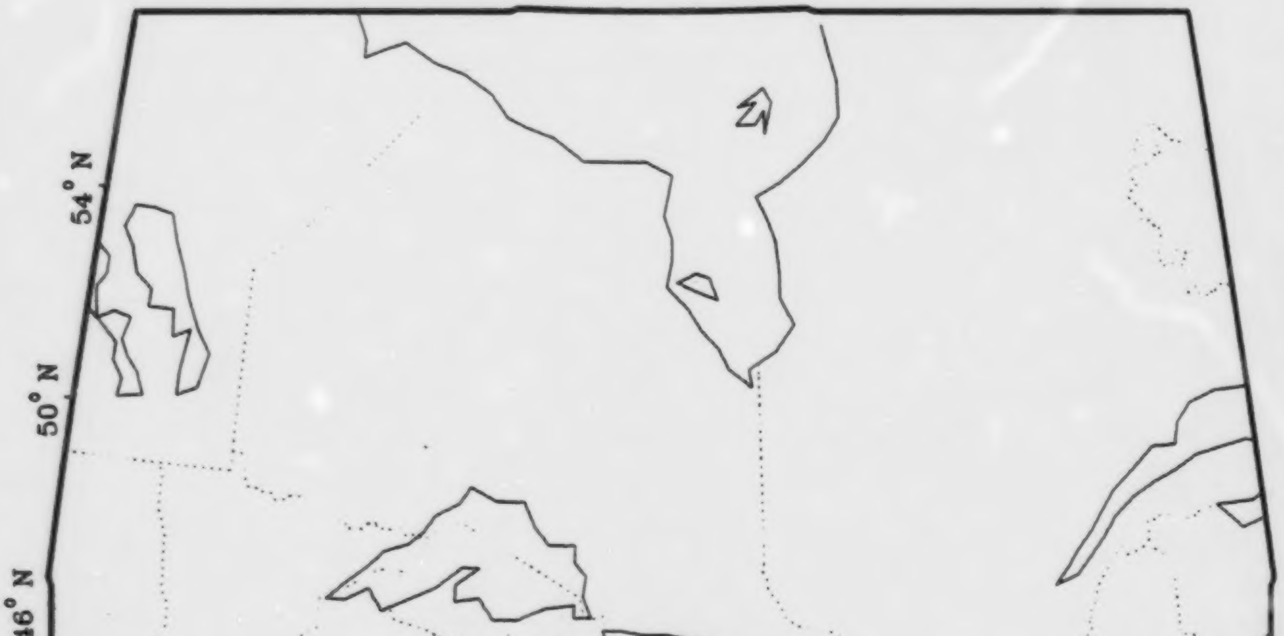

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.11.7

72 HOUR TRAJECTORIES
MON MAY27 85 12 Z

	LONGWOODS (AES)
700MB	+
850MB	Δ
925MB	○
1000MB	□

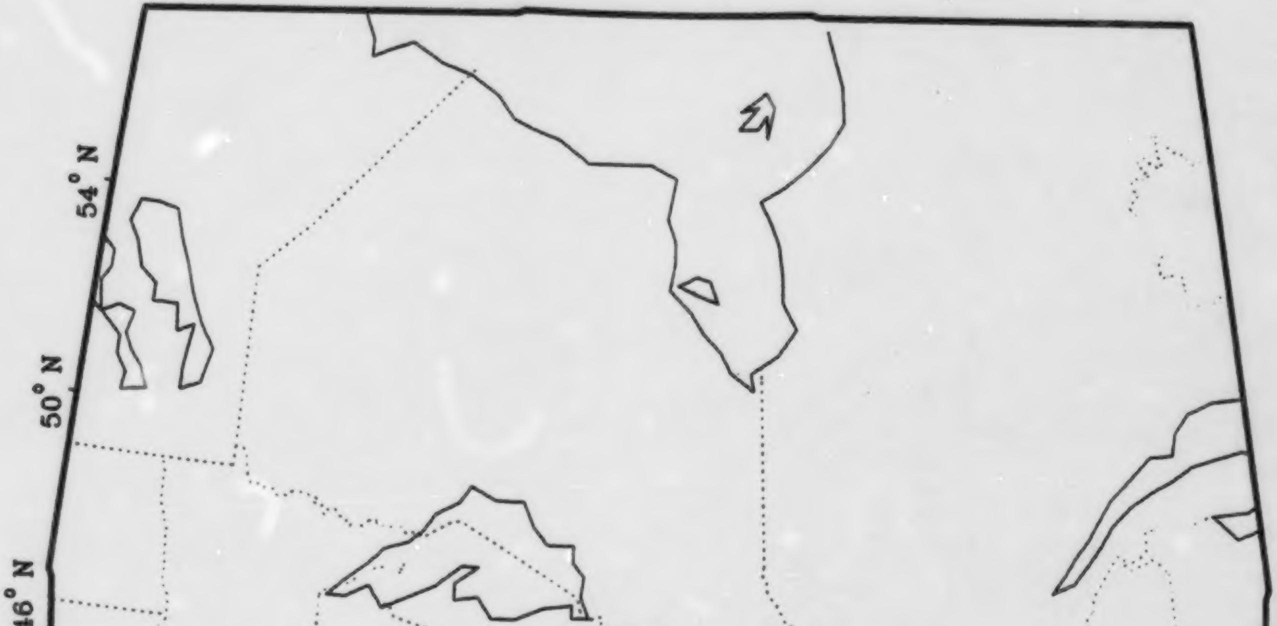

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.11.8

1.12 June 23-24, 1985, Chalk River

This episode ranked 4th (4/7) for only NO_3^- wet deposition.
A low pressure centre of 986 mb near Winisk in Northern Ontario with associated frontal system such that the cold front lay over northern Ontario and a wave over Michigan Wisconsin border near Green Bay, Wisconsin with frontal system were observed on June 23, at 12Z as shown in Fig. 1.12.1. The low moved in a NE direction such that the cold front passed over Chalk River and on June 24, at 12Z the front had moved eastward to lie over Quebec as shown in Fig. 1.12.2. The wave had moved to lie near New York as shown in the figure. The cold front passage triggered thunderstorms and thunder showers were recorded at Petawawa Airport, the nearest weather station, for a few hours as shown in Fig. 1.12.3. Lightning was observed and some rain showers were also recorded as illustrated in this figure.
The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for June 23, at 12Z, 18Z and June 24, at 00Z, 06Z and 12Z are shown in Figures 1.12.4, 1.12.5, 1.12.6, 1.12.7 and 1.12.8 respectively.
Air trajectories for 1000 mb level are such that NO_x from high emission Detroit area (Fig 1.12.4), Pittsburg, Pennsylvania (Fig. 1.12.5) and Washington, D.C.- Marryland area (Figures 1.12.5-6) could have been transported to Chalk River.
Air parcels arriving at 925 mb level could have carried NO_x from the highest emission Chicago area(Figures 1.12.4 & 6) and high emission Detroit area (Fig. 1.12.7).
Air trajectories for 850 level passed over the highest NO_x emission Chicago area for some time(Fig. 1.12.6) and could have also transported NO_x.
Air trajectories for 700 mb level did not pass over any significant NO_x emission area and thus any pollution transport at this level would be insignificant.
In summary, a cold front passage yielded thunder showers and transport of NO_x at low level of 925 mb and high level of 850 mb from the Highest emission Chicago area was probable during this episode. NO_x transport at 1000 mb level from high emission sources in Detroit, Pittsburg and Washington, D.C. area was also likely.

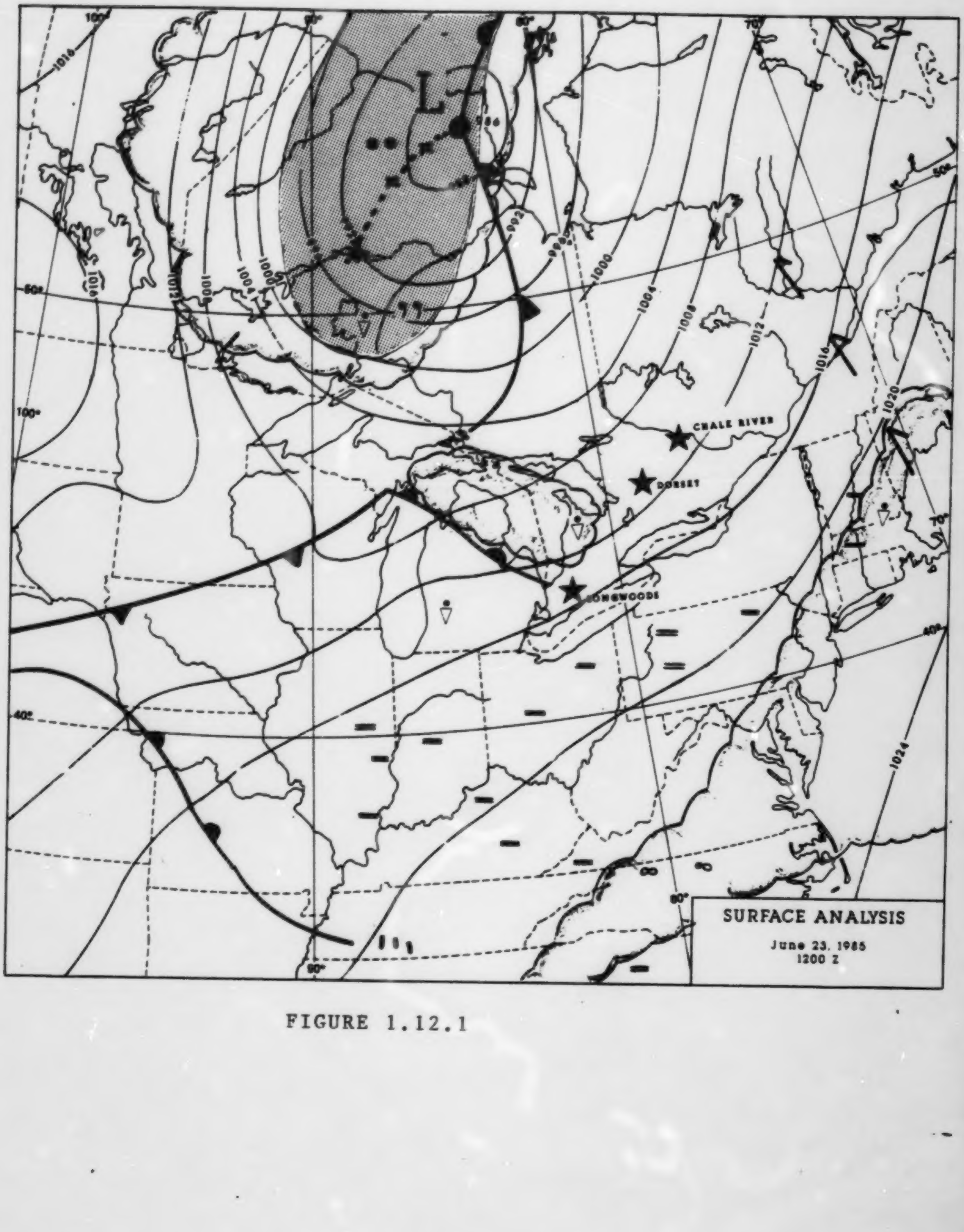

SURFACE ANALYSIS
June 23, 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
L
988
992
996
1000
1004
1008
1012
1016
1020
1024
100°
90°
80°
70°
50°
40°

FIGURE 1.12.1

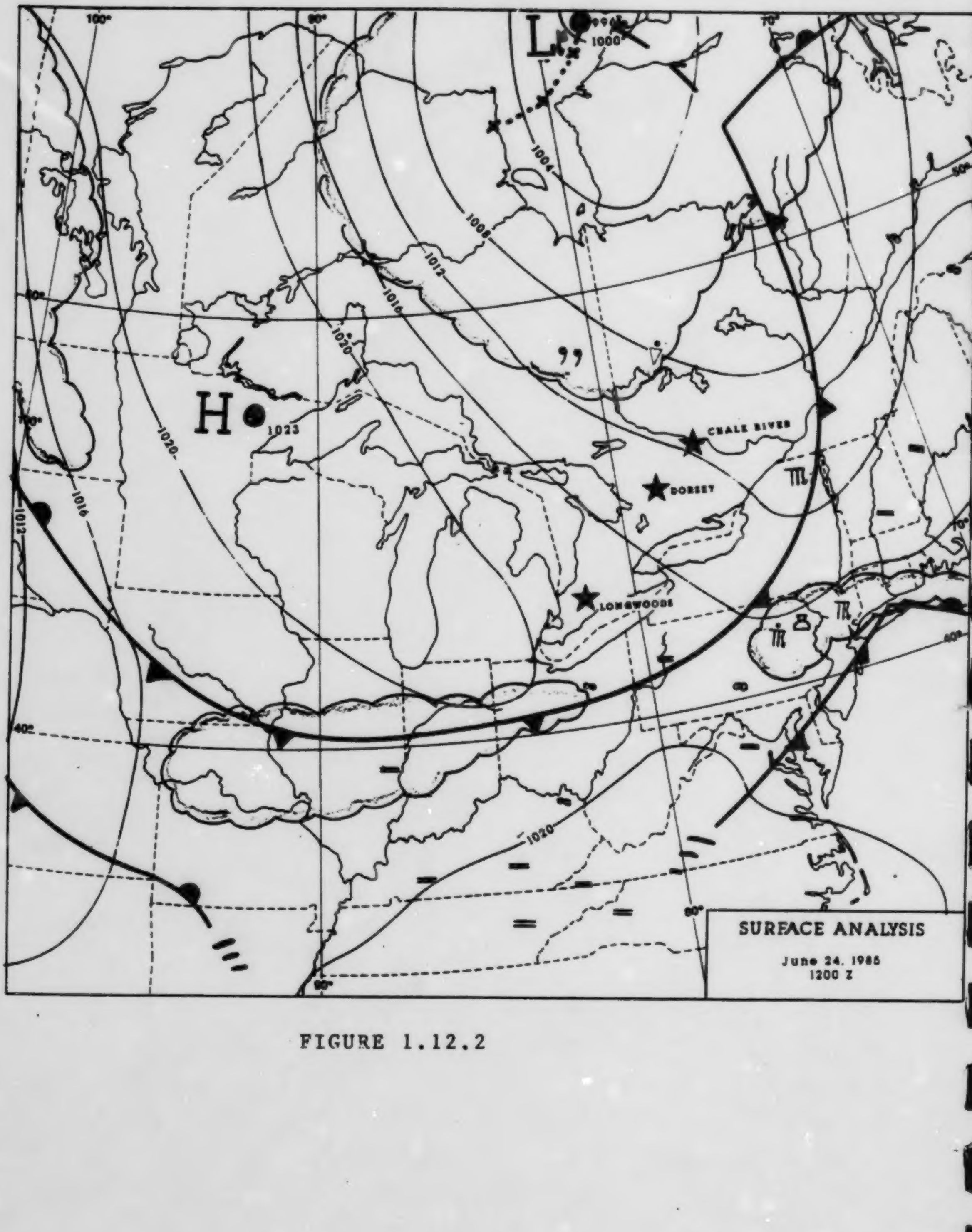
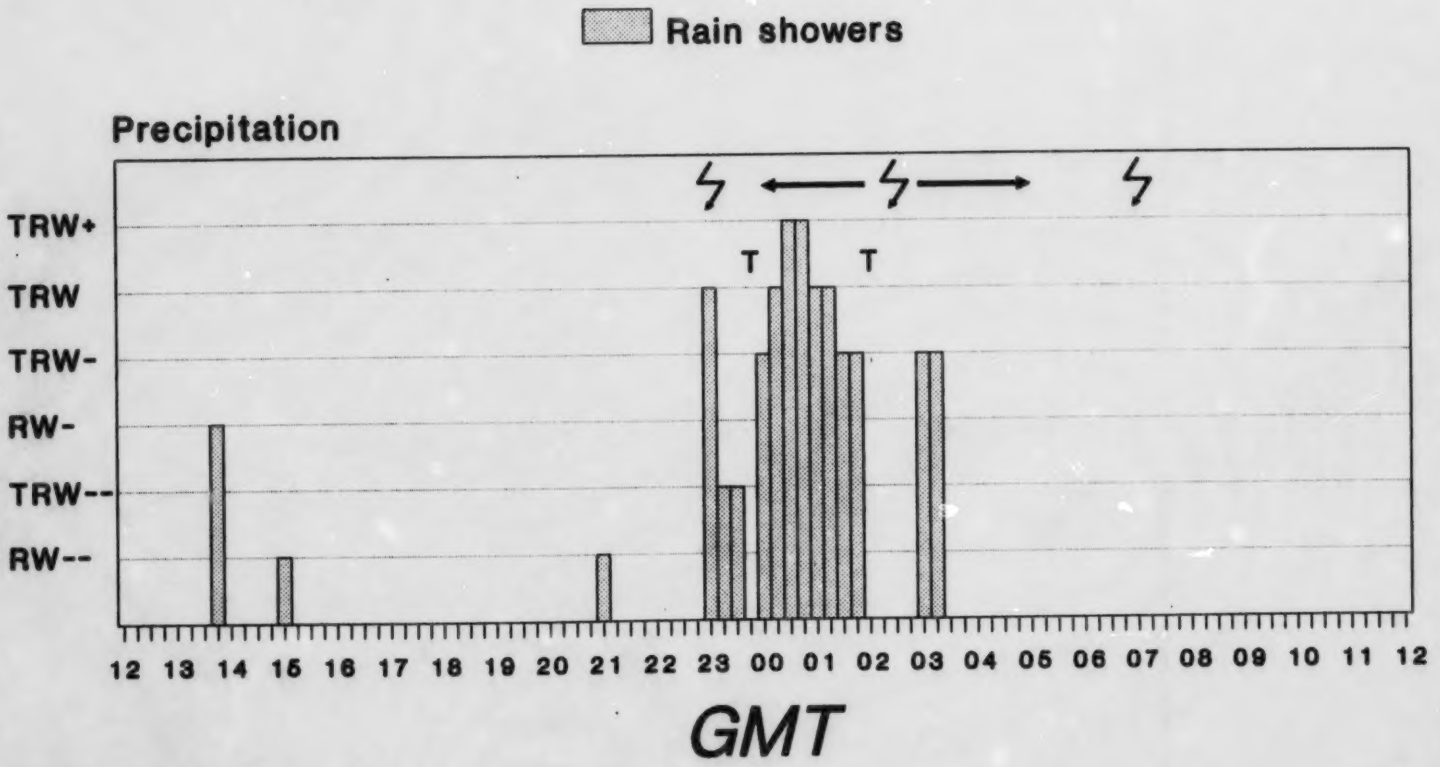

L
996
1000
1004
1008
1012
1016
1020
H
1023
1020
1016
1012
1020
CHALK RIVER
DORSET
LONGWOODS
100°
90°
70°
50°
60°
70°
40°
80°
SURFACE ANALYSIS
June 24, 1985
1200 Z

FIGURE 1.12.2

Petawawa A
June 23-24, 1985



RW - Rain showers
T - Thunder

FIGURE 1.12.3

72 HOUR TRAJECTORIES
SUN JUN23 85 12 Z

	CHALK RIVER (AES)
700MB	+
850MB	△
925MB	○
1000MB	□

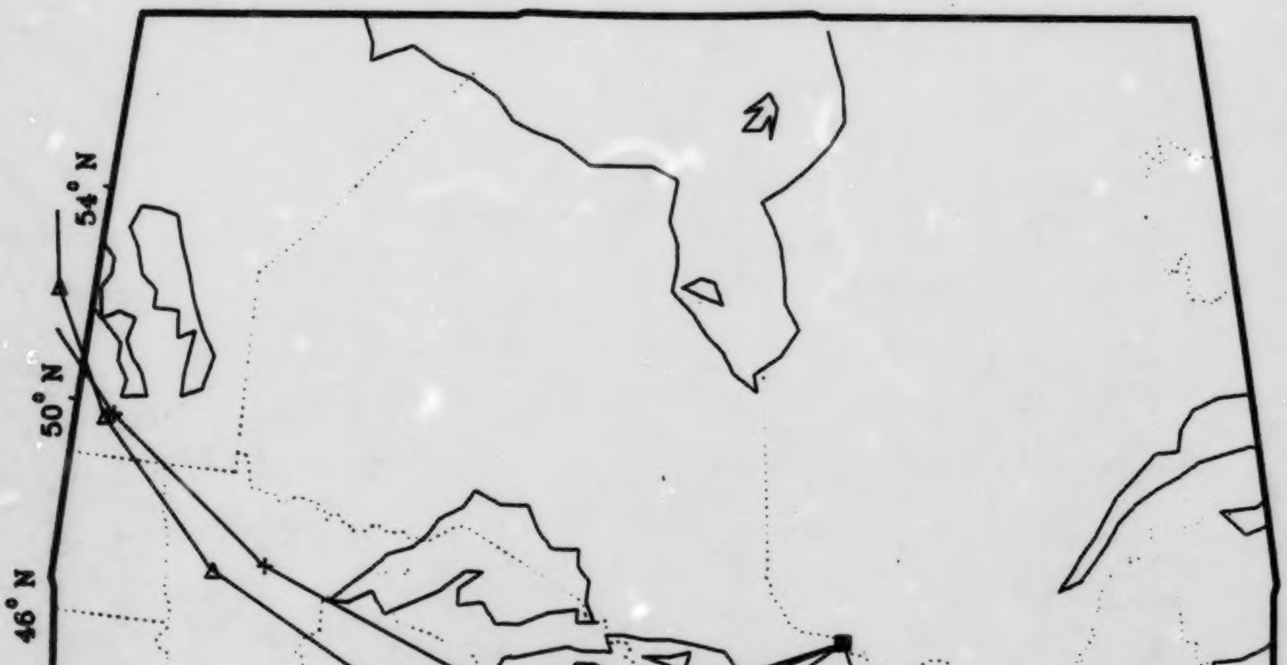

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.12.4

72 HOUR TRAJECTORIES

SUN JUN23 85 18 Z

	CHALK RIVER (AES)
700MB	+
850MB	△
925MB	○
1000MB	□

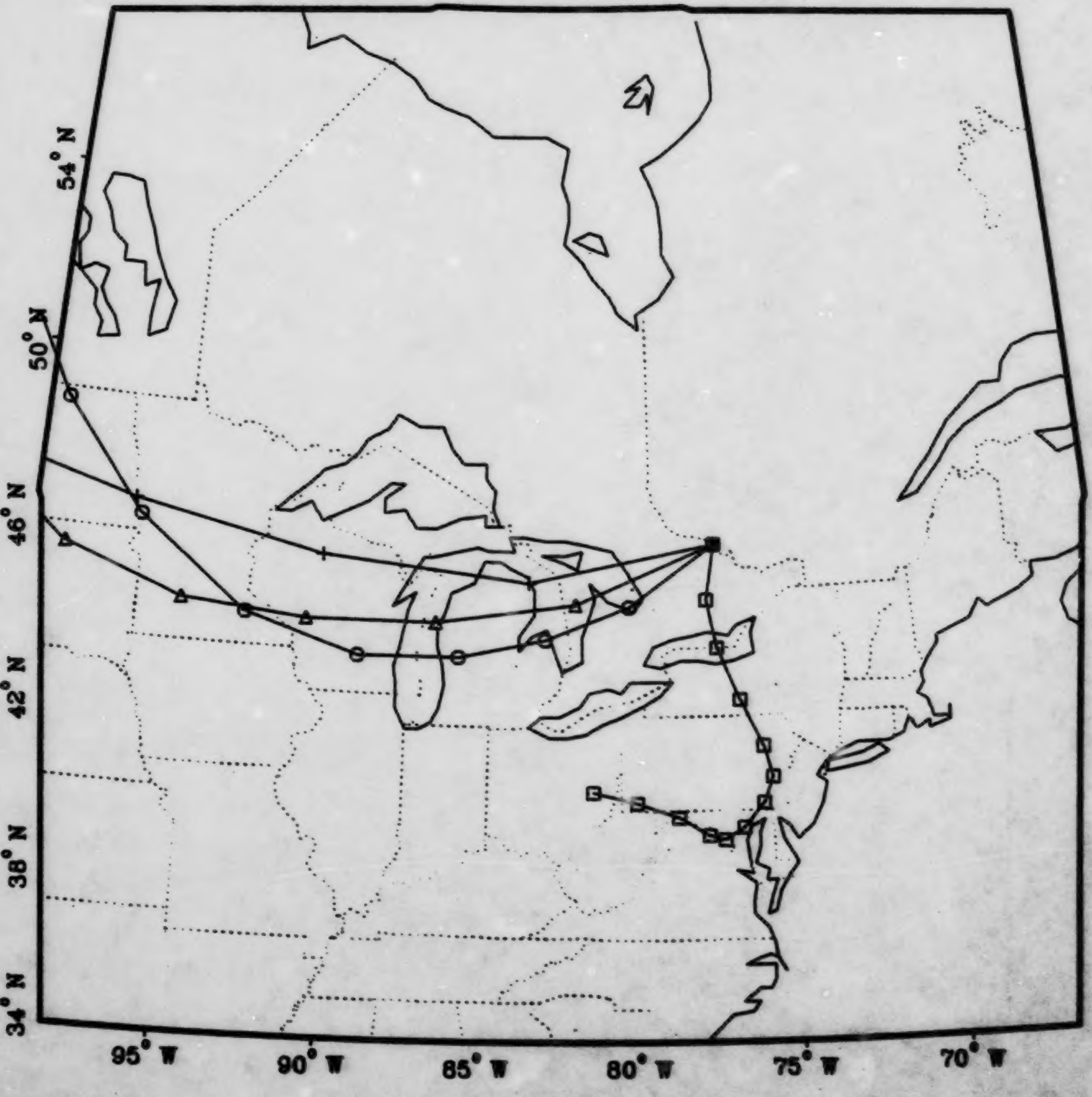
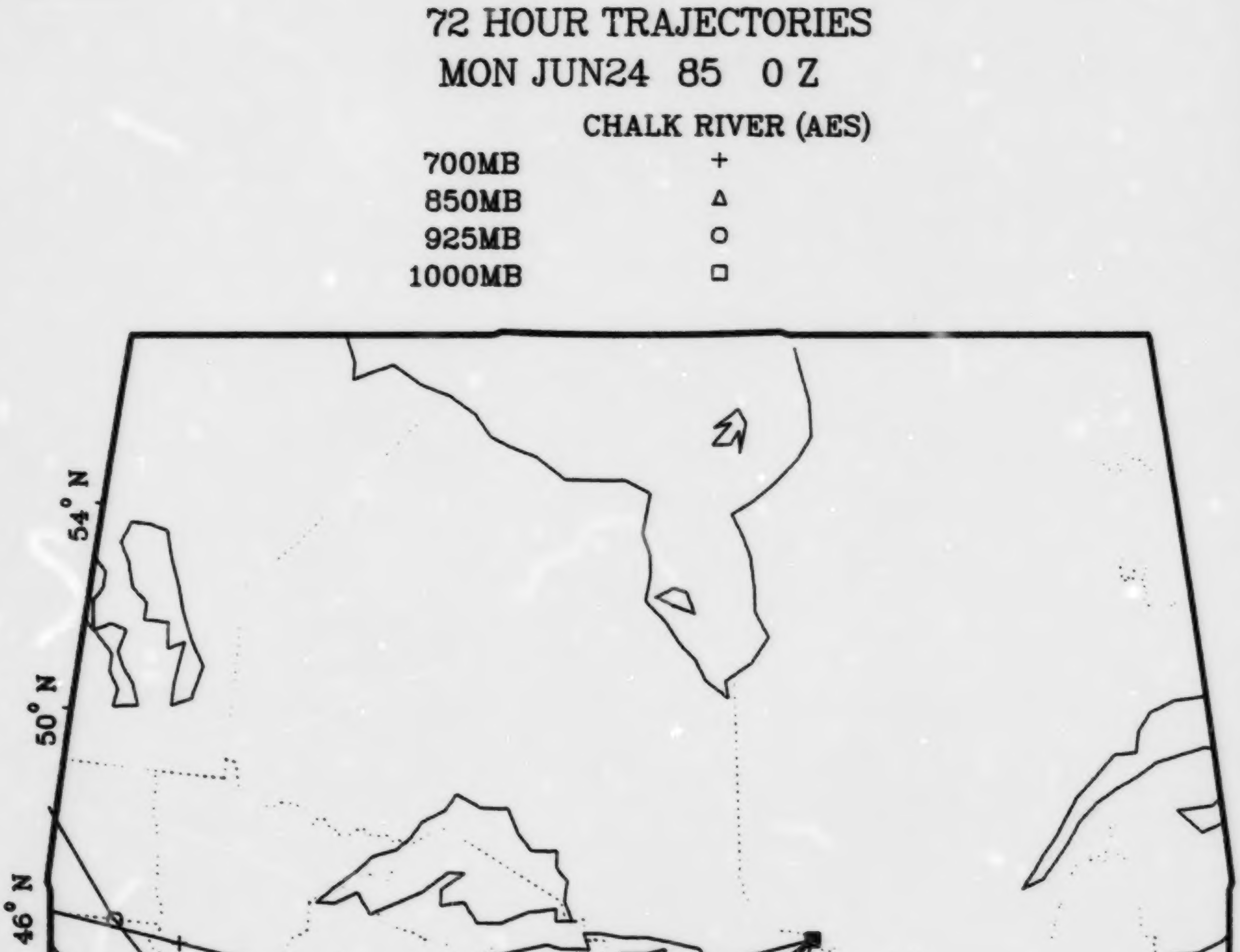

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.12.5



72 HOUR TRAJECTORIES
MON JUN24 85 0 Z

CHALK RIVER (AES)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.12.6

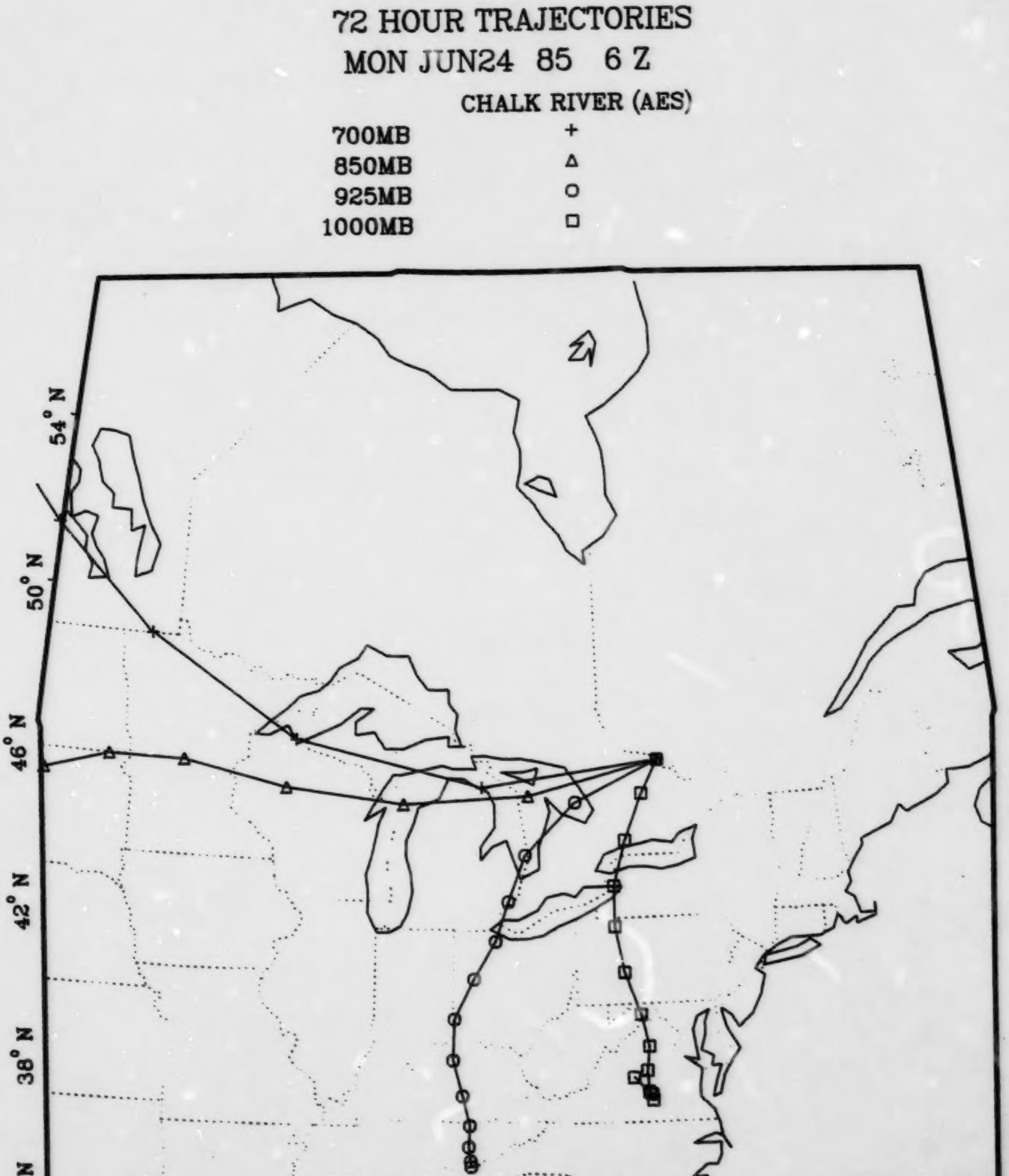

72 HOUR TRAJECTORIES
MON JUN24 85 6 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.12.7

72 HOUR TRAJECTORIES
MON JUN24 85 12 Z
CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

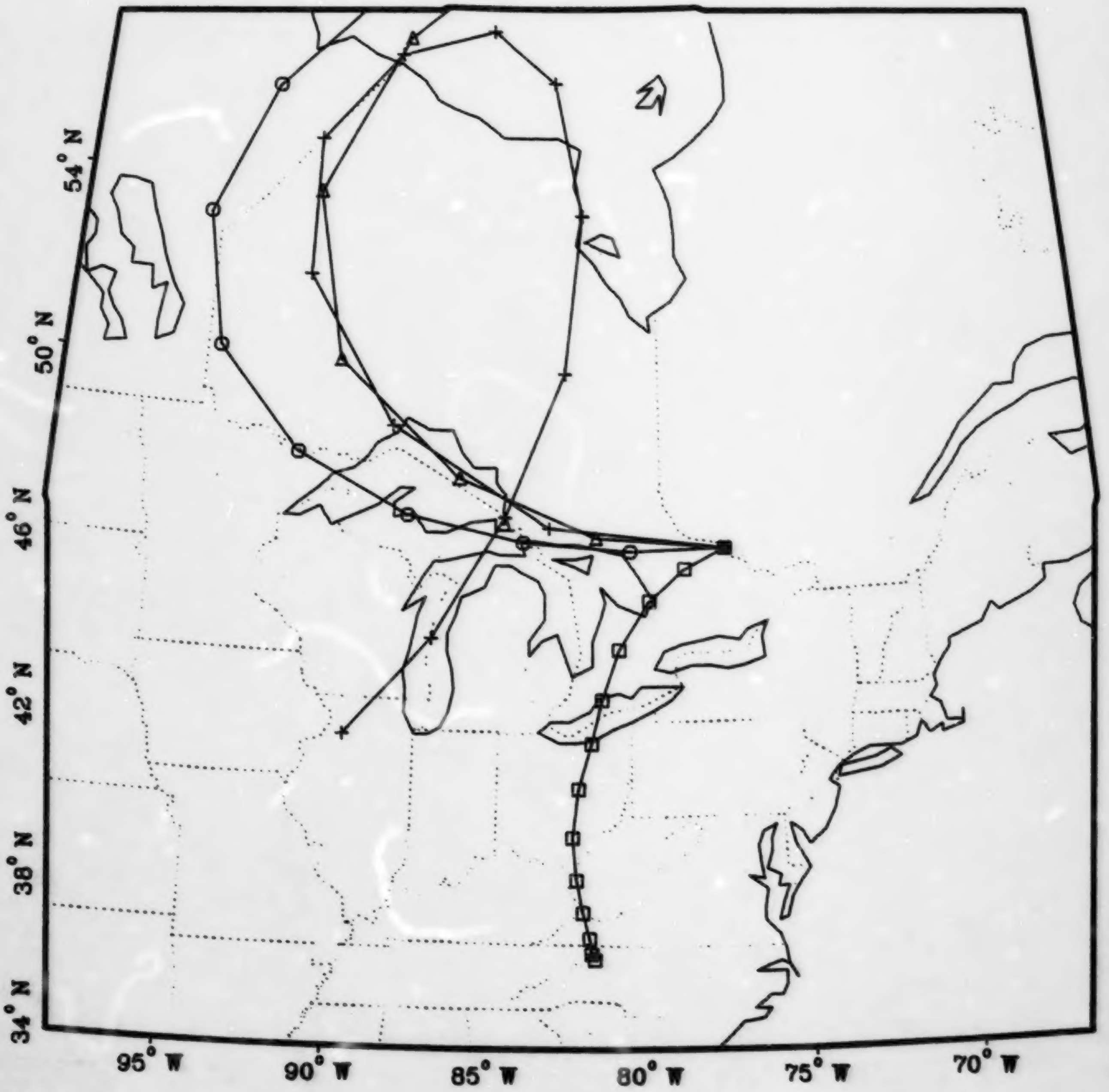

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.12.8

1.13 July 5-6, 1985. Chalk River

This episode ranked 2nd (2/5) and 3rd (3/7) for $SO_4^=$ and NO_3^- wet deposition events, respectively.

A low pressure centre of 1001 mb over Lake Michigan, north of Traverse City, with associated frontal system such that the warm front lay over Ontario, as shown in Fig. 1.13.1, was observed on July 5, at 12Z. This low moved very slowly in an approximately eastward direction and on July 6, at 12 Z it was situated on Lake Huron as shown in Fig. 1.13.2. A wave SW from Chalk River with the warm front lying in ENE direction over eastern Ontario and Quebec was observed at this time as shown in the figure. With the movement of this low, first the warm front passed over Chalk River to lie north of the station and then later moved south of the station. This yielded showers and thundershowers at the nearby weather station intermittently and lightnings were observed for several hours as illustrated in Fig. 1.13.3.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for July 5, at 12Z, 18Z and July 6, at 00Z, 06Z and 12Z are shown in Figures 1.13.4, 1.13.5, 1.13.6, 1.13.7 and 1.13.8 respectively.

Air parcels arriving at 1000 mb level show that SO_2 from the highest emission areas in Ohio-Pennsylvania-West Virginia (see Fig. 2) could have been transported to Chalk River as shown in Figures. 1.13.5-8. NO_x transport from the high emission areas in Ohio-Pennsylvania-West Virginia (see Fig. 3) was also likely as exhibited in Figures 1.13.4-8.

Air trajectories for 925 mb level show that SO_2 and NO_x from the highest emission Chicago area could have been transported at this level as the trajectories passed over it as shown in Fig. 1.13.4. Transport of SO_2 from its highest and NO_x from its high emission areas in Ohio-Pennsylvania-West Virginia was also probable as shown in Figures. 1.13-6-8.

Air trajectories for 850 mb level did not pass over any highest emission areas of SO_2 & NO_x and therefore pollution transport at this level would be of lesser importance than other levels during this episode.

Air parcels arriving at 700 mb level could have carried SO_2 & NO_x from the highest emission Chicago area as shown in Fig. 1.13.4 , SO_2 from the highest emission area in Illinois and Detroit region, Michigan, as shown in Fig. 1.13.6. Pollutant transport from other high regions was also probable as shown in Figs. 1.13.4-8.

Summarizing, warm front passages yielded convective weather over the station yielding rain showers and thundershowers. Lightnings were observed at the nearby weather station. SO_2 transport from the highest emission Chicago area at low level(925 mb) and high level (700 mb), the areas in Ohio-Pennsylvania-West Virginia at low levels(1000 mb & 925 mb) and from the areas in Illinois and Detroit area in Michigan was probable. NO_x transport from the Chicago area at low (925 mb) and high (700 mb) levels was also probable. Transports of SO_2 and NO_x from a number of high emission areas were also likely.

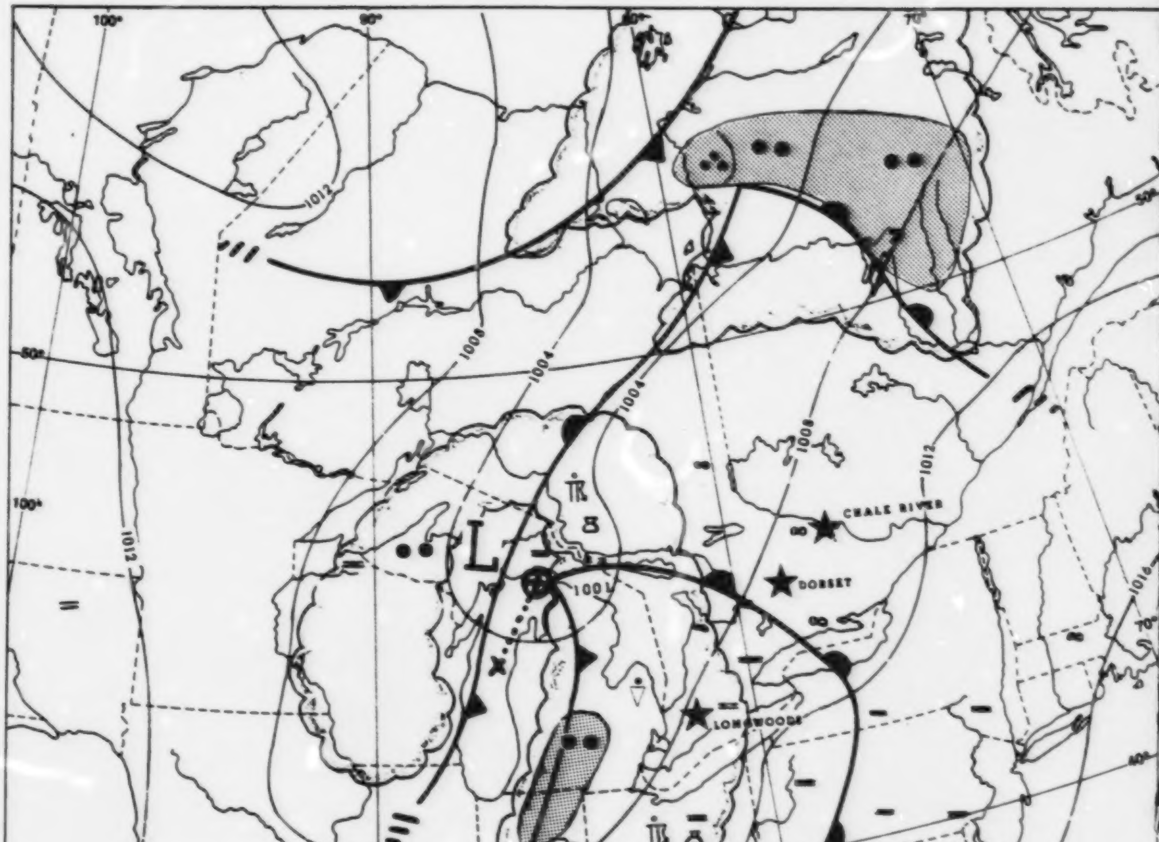

SURFACE ANALYSIS
July 5. 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
L
1012
1008
1004
1004
1001
1008
1012
1012
1016
100°
90°
80°
70°
60°
50°
50°
40°
40°
100°
90°
80°
70°

FIGURE 1.13.1

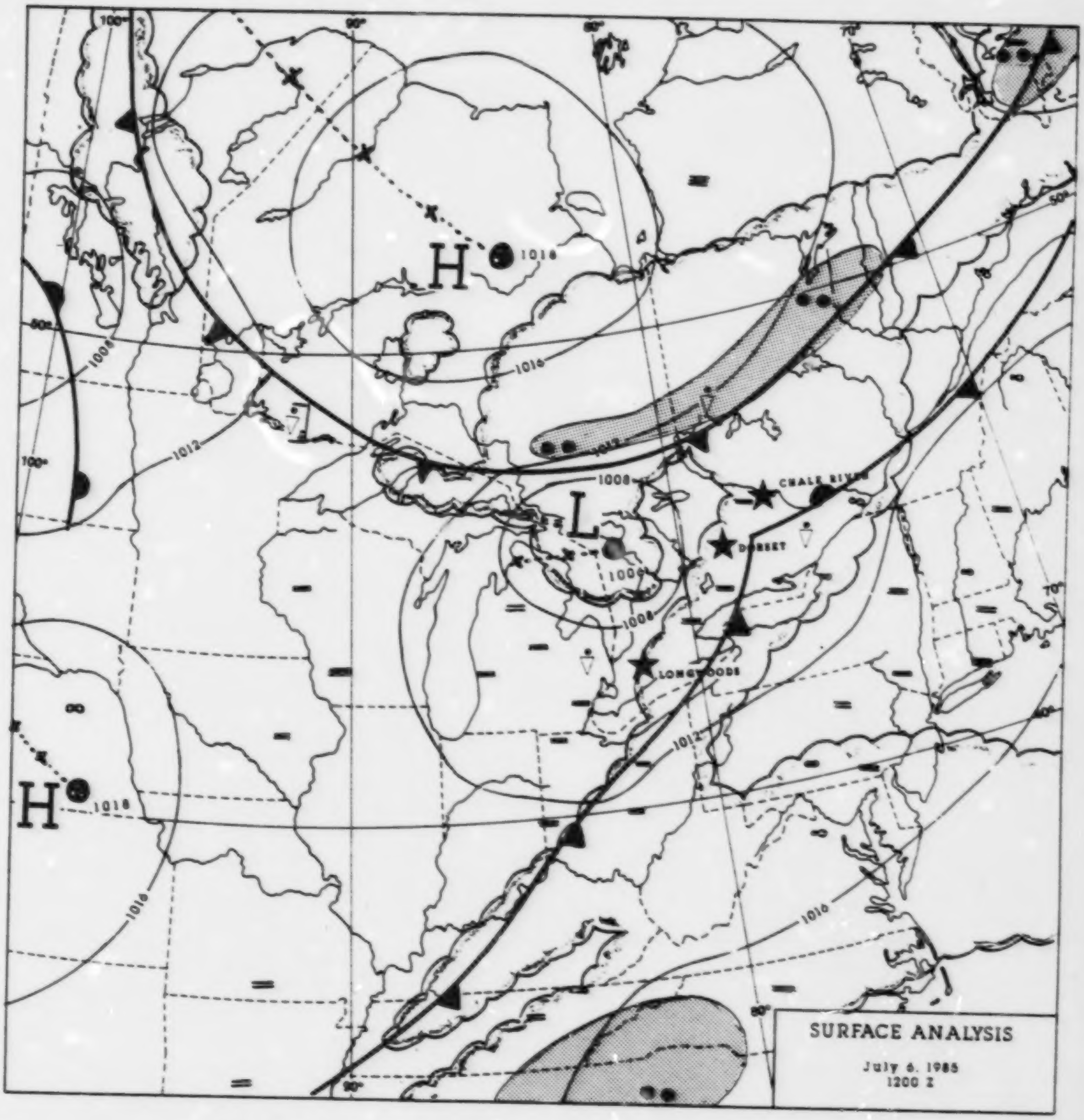
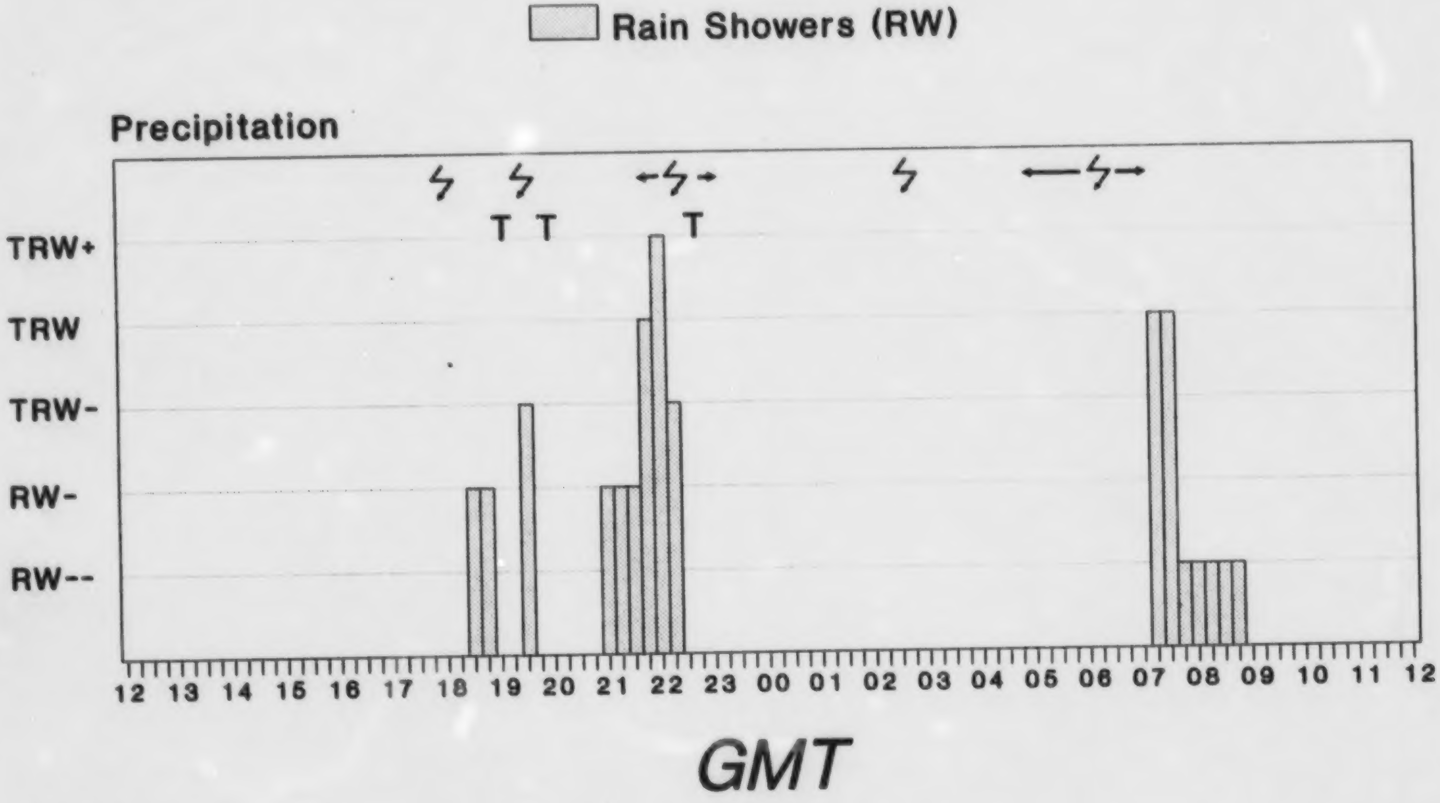

SURFACE ANALYSIS
July 6, 1985
1200 Z
H
H
L
1016
1012
1008
1004
CHALK RIVER
DORSET
LONGWOODS
100°
90°
80°
70°
50°
40°

FIGURE 1.13.2

Petawawa A

July 5-6, 1985



T - Thunder

FIGURE 1.13.3

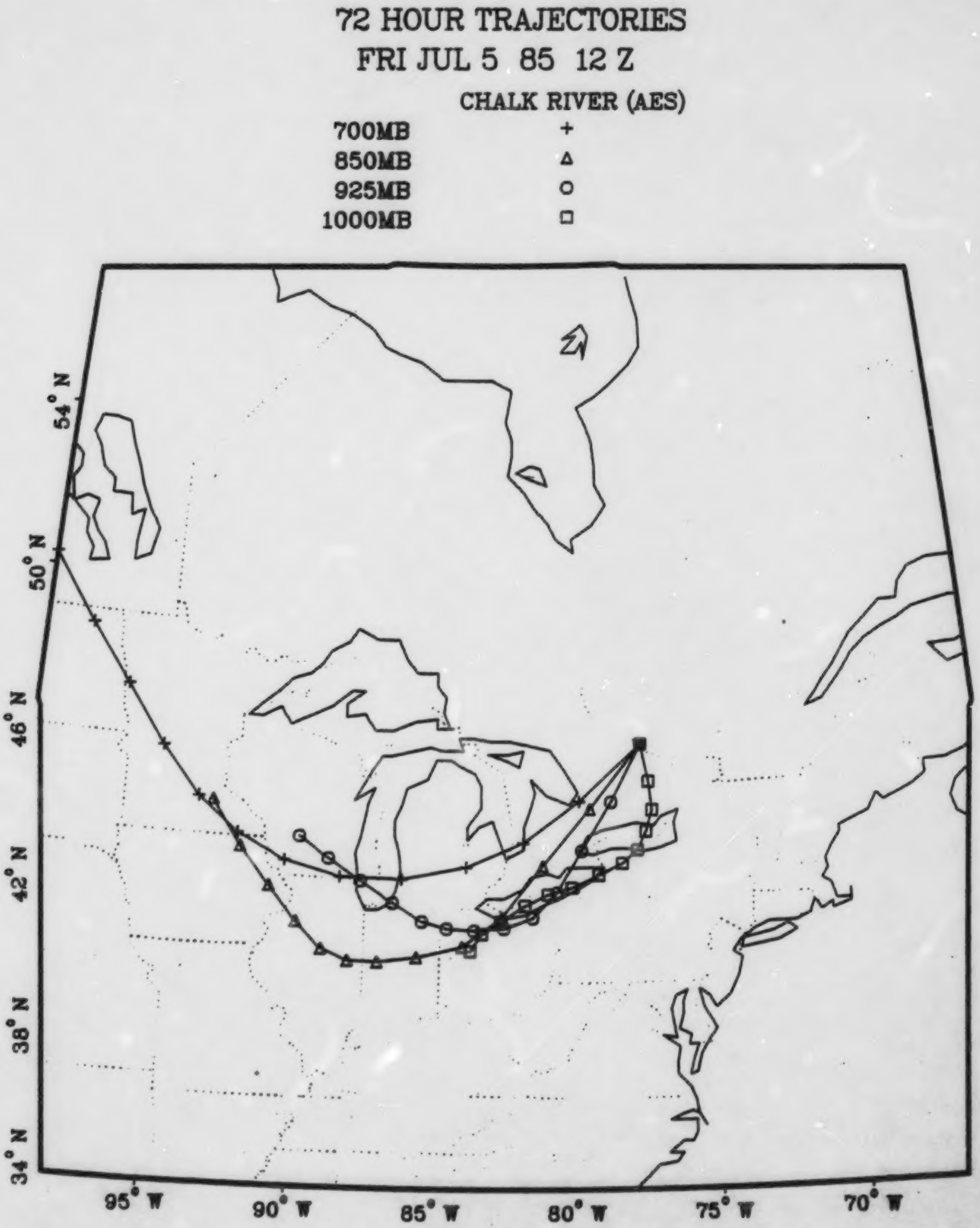

72 HOUR TRAJECTORIES
FRI JUL 5 85 12 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.13.4

72 HOUR TRAJECTORIES
FRI JUL 5 85 18 Z

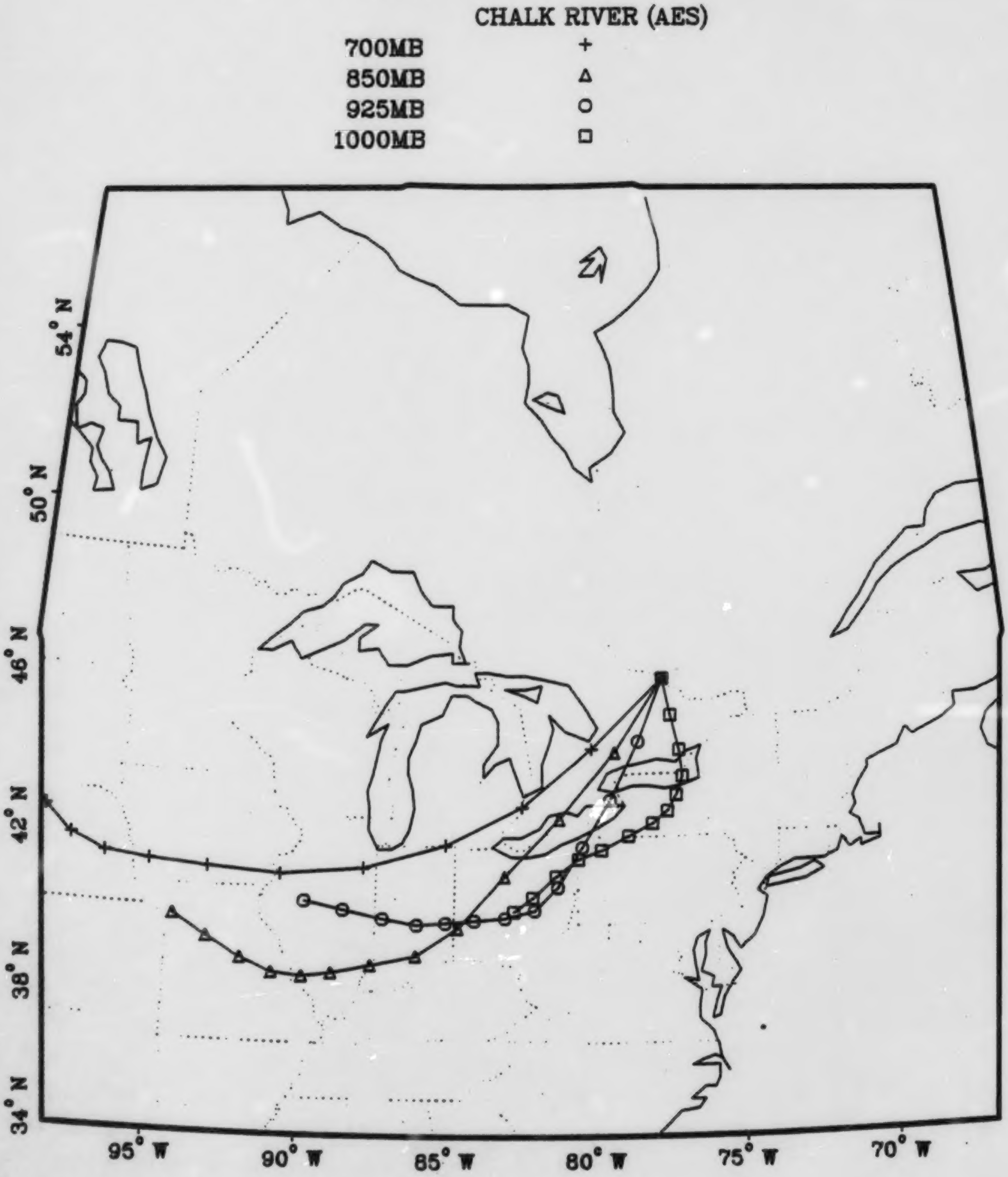

CHALK RIVER (AES)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.13.5

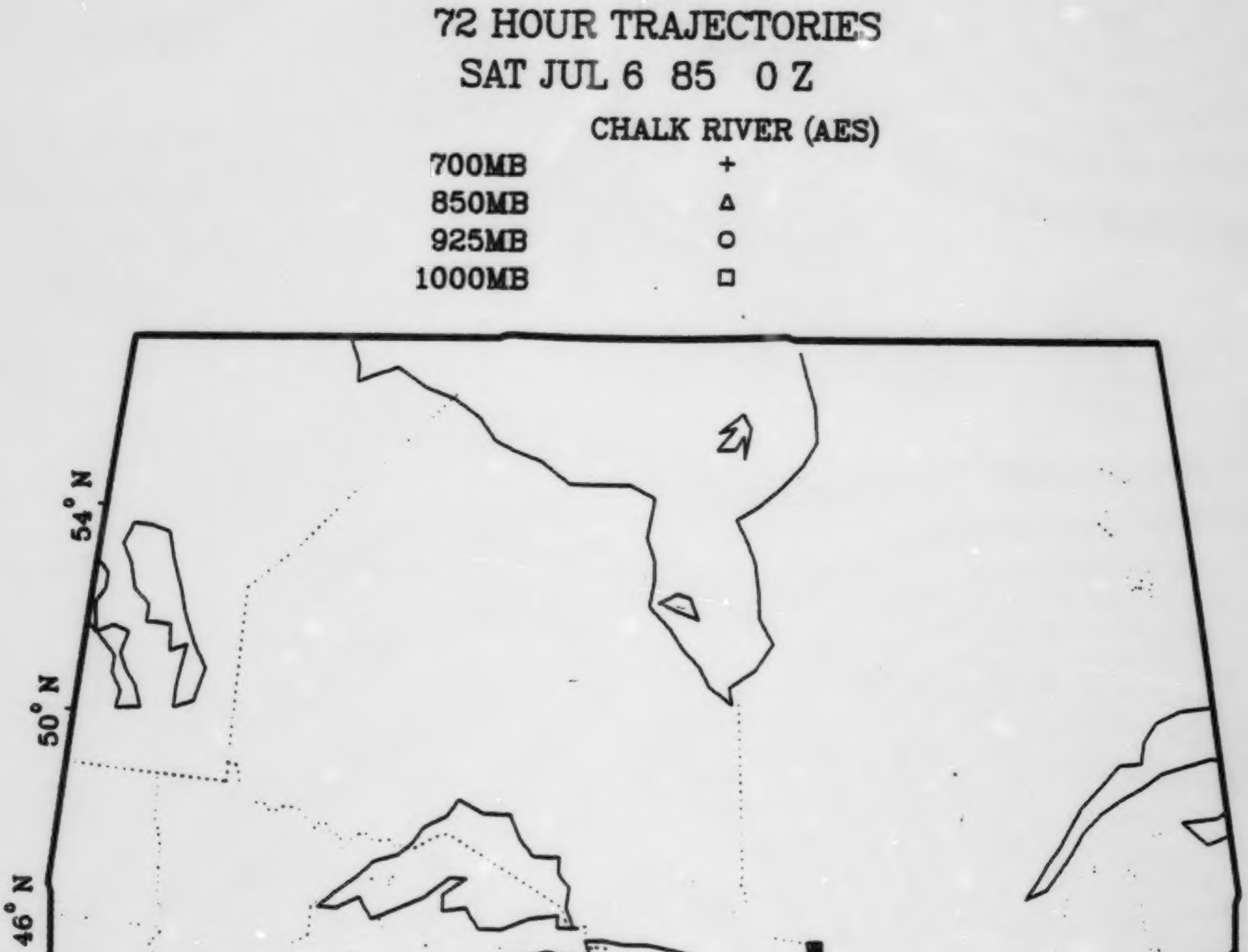

72 HOUR TRAJECTORIES
SAT JUL 6 85 0 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.13.6

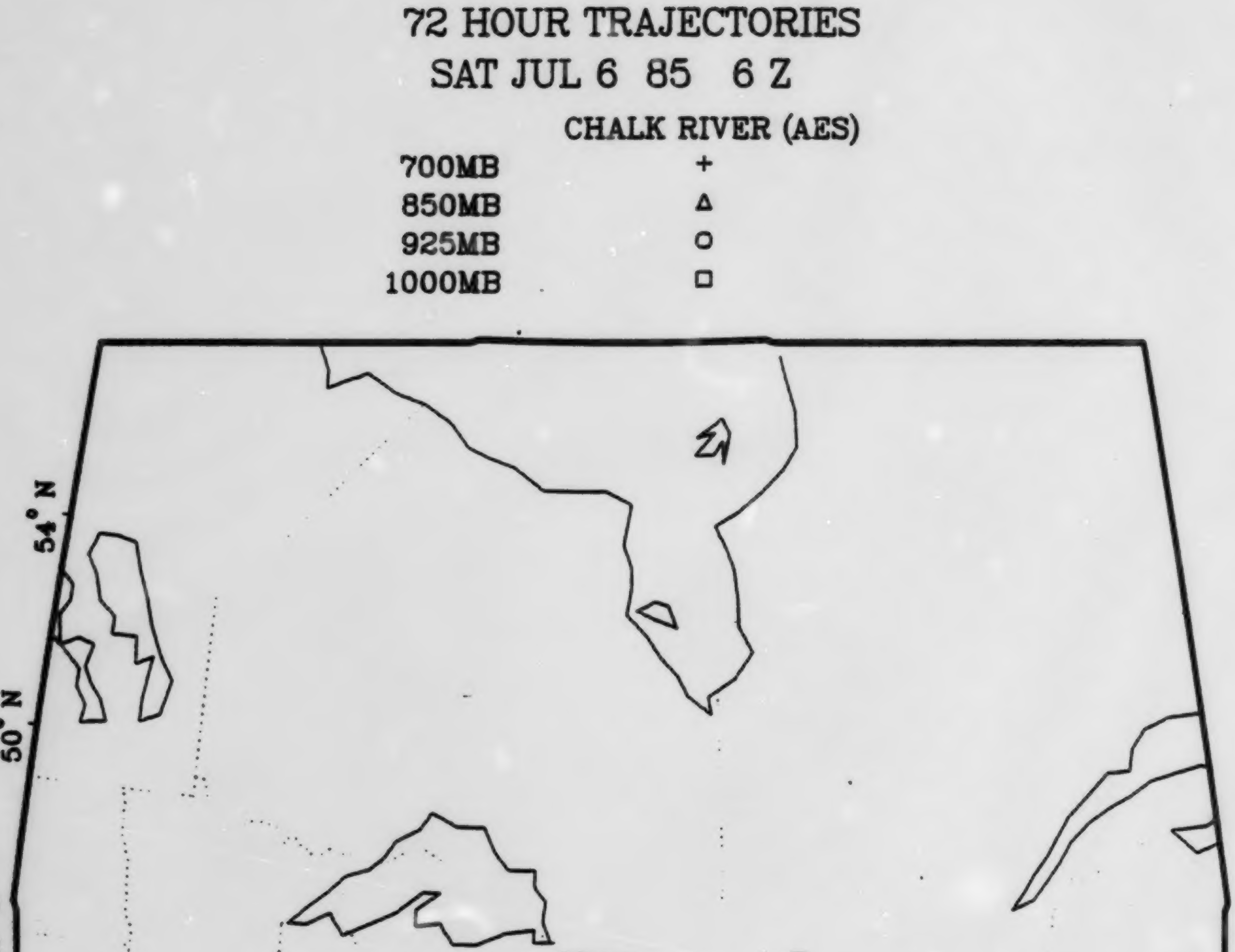

72 HOUR TRAJECTORIES
SAT JUL 6 85 6 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.13.7

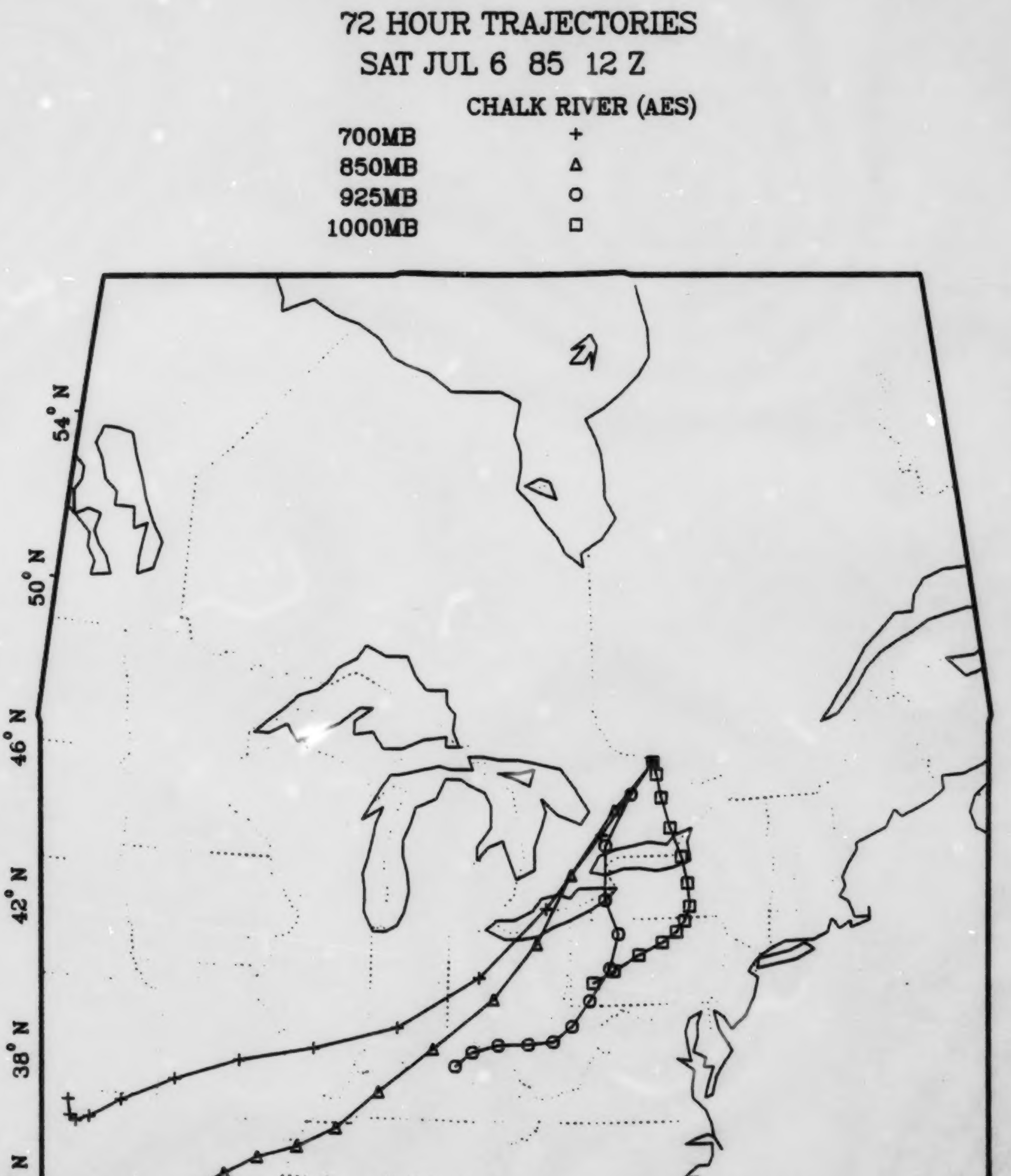

72 HOUR TRAJECTORIES
SAT JUL 6 85 12 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.13.8

1.14 August 6-7, 1985, Dorset

This event was ranked last for both SO_4^- (8/8) and NO_3^- (12/12) top 25% wet deposition events.

A wave over Michigan SE from Sault Ste. Marie with associated frontal system such that the warm front lay near Detroit was analyzed on August 6, at 12Z as shown in Fig. 1.14.1. The wave moved eastward and first the warm front and later cold front passed over Dorset. On August 7, at 12Z, another cold front lay near Sault Ste Marie as shown in Fig. 1.14.2. The movement of the wave and the frontal passage yielded light and very light rain showers at the nearest weather station Muskoka Airport as shown in Fig. 1.14.3.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for August 6, at 12Z, 18Z and August 7, at 00Z, 06Z and 12Z are shown in Figures 1.14.4, 1.14.5, 1.14.6, 1.14.7 and 1.14.8 respectively.

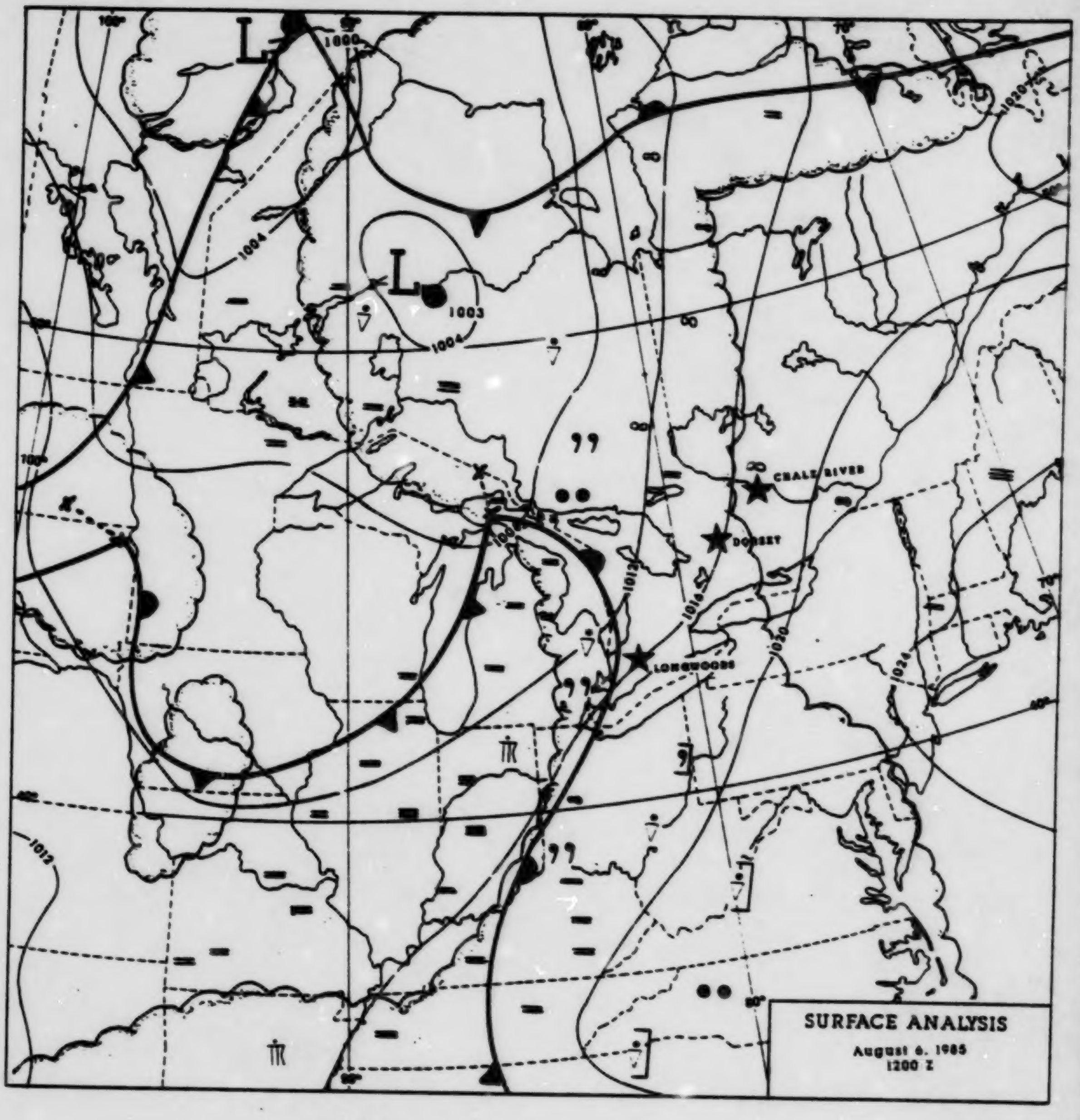
Air trajectories for 1000 mb level show that they did not pass over any highest emission area of SO_2 & NO_x . However, SO_2 and NO_x from the high emission areas in Pennsylvania-Maryland-Virginia could have been transported at this level as illustrated in Figs. 1.14.4-8.

Air parcels arriving at 925 mb level show that SO_2 from the highest emission areas in Pennsylvania-Ohio-West Virginia could have been transported as shown in Figs. 1.14.4-6 and Detroit, Michigan as illustrated in Fig. 1.14.8. NO_x from these high emission areas could also have been carried.

Air trajectories at 850 mb level veered continuously as shown in Figs. 1.14.4-8. Transport of SO_2 from the highest emission Detroit area (see Figs. 1.14-6-7) and Chicago area (see Figs. 1.14.7-8) and other area in Illinois, and of NO_x from its highest emission Chicago area (see Figs. 1.14.7-8) were likely.

Air trajectories for 700 mb level rapidly passed over highest emission area of SO_2 in Detroit region (see Figs. 1.14.4-5), of SO_2 NO_x in Chicago region (Figs. 1.14-5-6) and of SO_2 in other region in Illinois (Fig. 1.14.5) and therefore likely transporting pollution from these regions to Dorset.

In summary, a rapid weak frontal system (warm and cold fronts) passed over the station yielding rain showers for a few hours. Transport of SO_2 at low level(925 mb) from Detroit, Michigan, and Pennsylvania-Ohio-West Virginia areas, and at high levels (850mb & 700 mb) from Detroit, Chicago and other areas in Illinois was probable. Transport of NO_x from Chicago area at high levels was also likely. NO_x could also have been carried from other high emission areas at low levels.


L
L
1000
1003
1004
1004
1008
1012
1012
1016
1020
1024
1020
100°
90°
80°
70°
60°
40°
CHALK RIVER
DORSET
LONGWOODS

SURFACE ANALYSIS

August 6, 1985
1200 Z

FIGURE 1.14.1

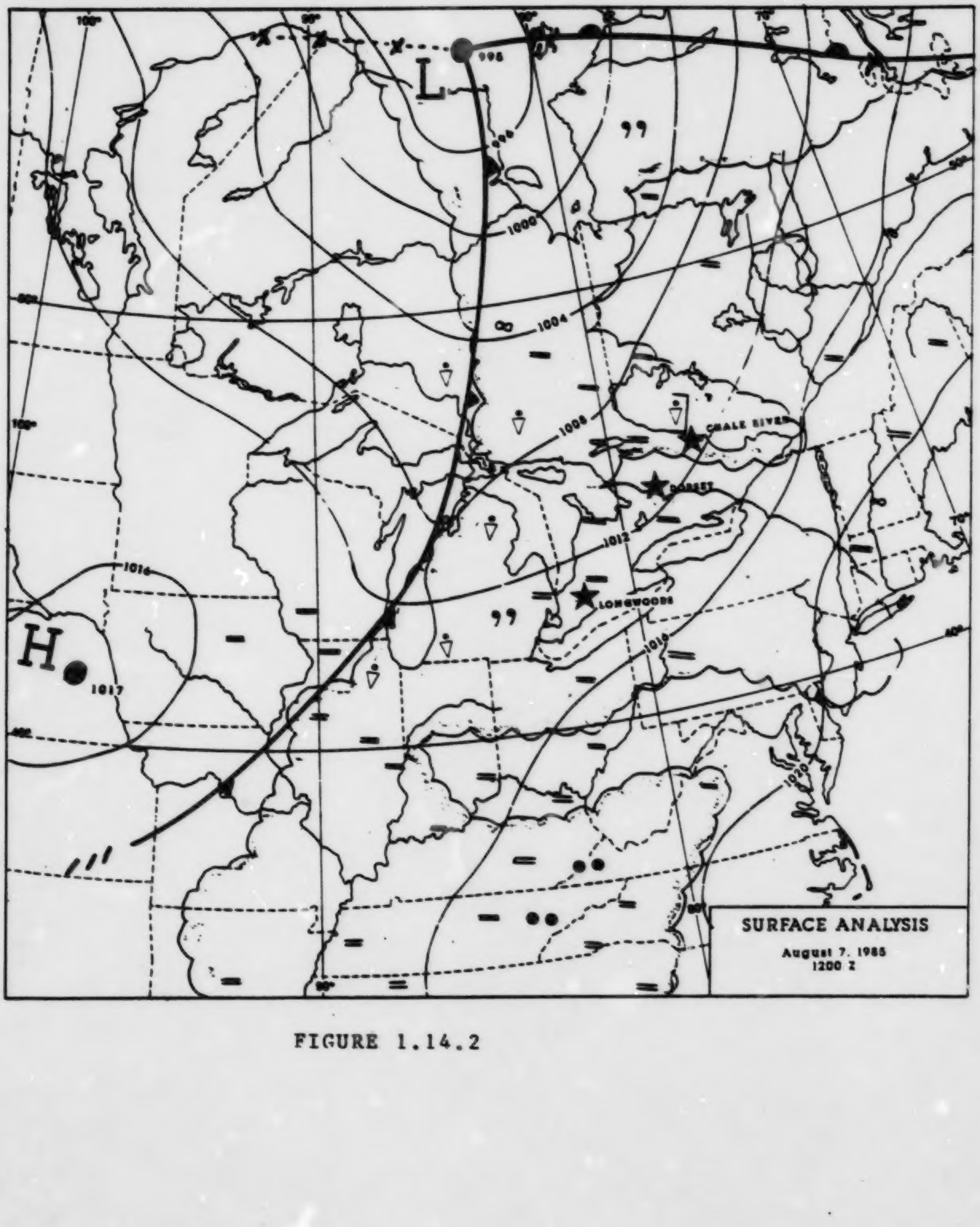
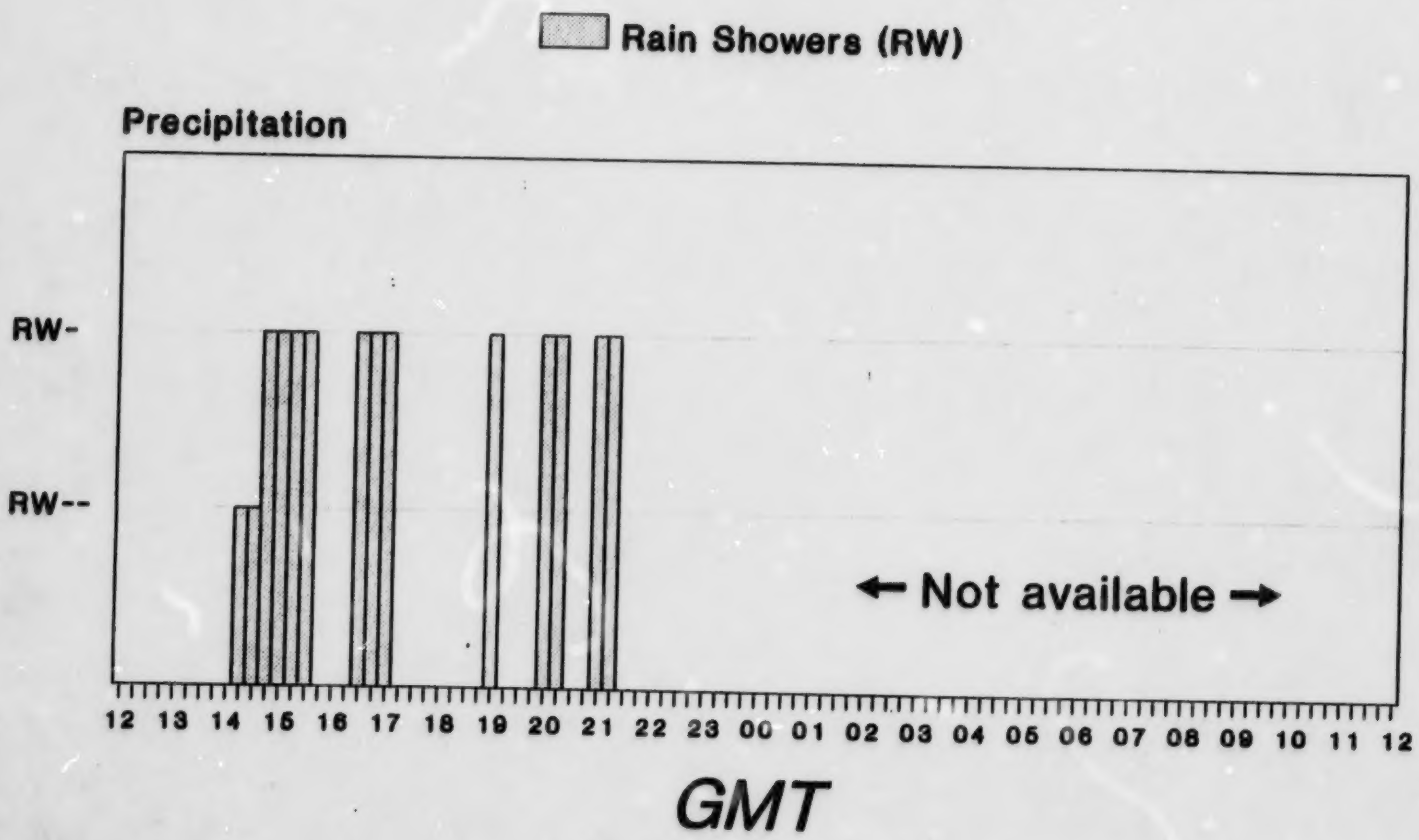

L
996
998
1000
1004
1008
1012
1016
1017
1020
H
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
August 7, 1985
1200 Z

FIGURE 1.14.2



Muskoka A
Aug. 6-7, 1985

FIGURE 1.14.3

72 HOUR TRAJECTORIES
TUE AUG 6 85 12 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

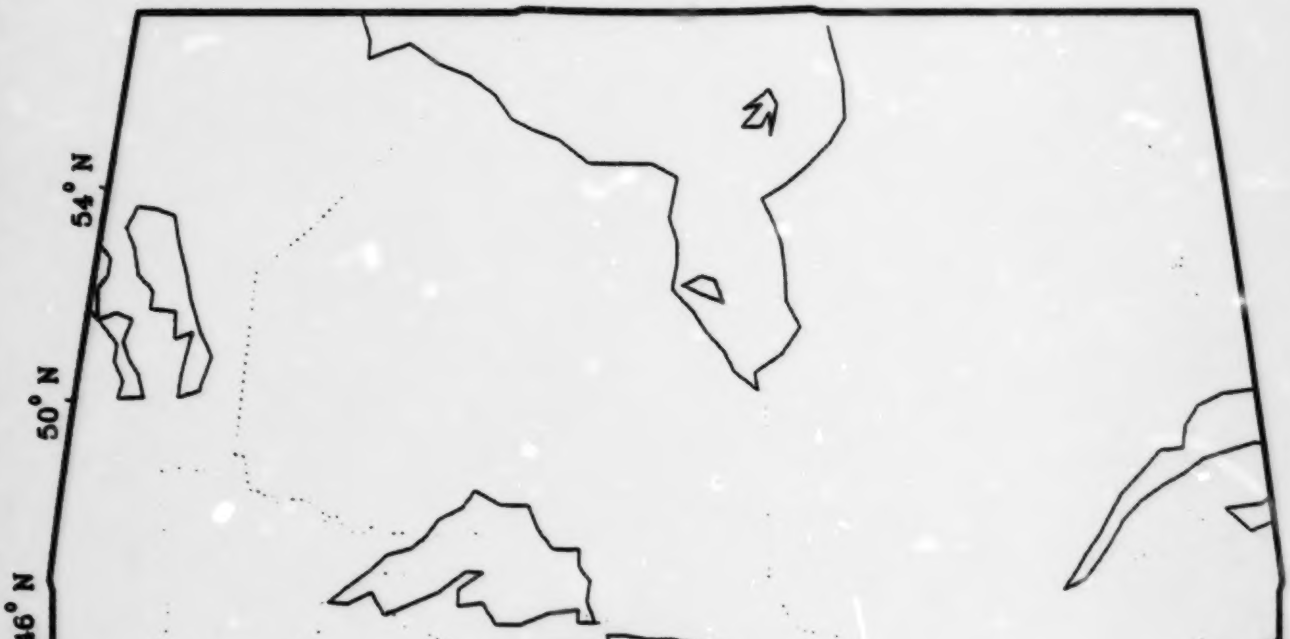

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.14.4

72 HOUR TRAJECTORIES
TUE AUG 6 85 18 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

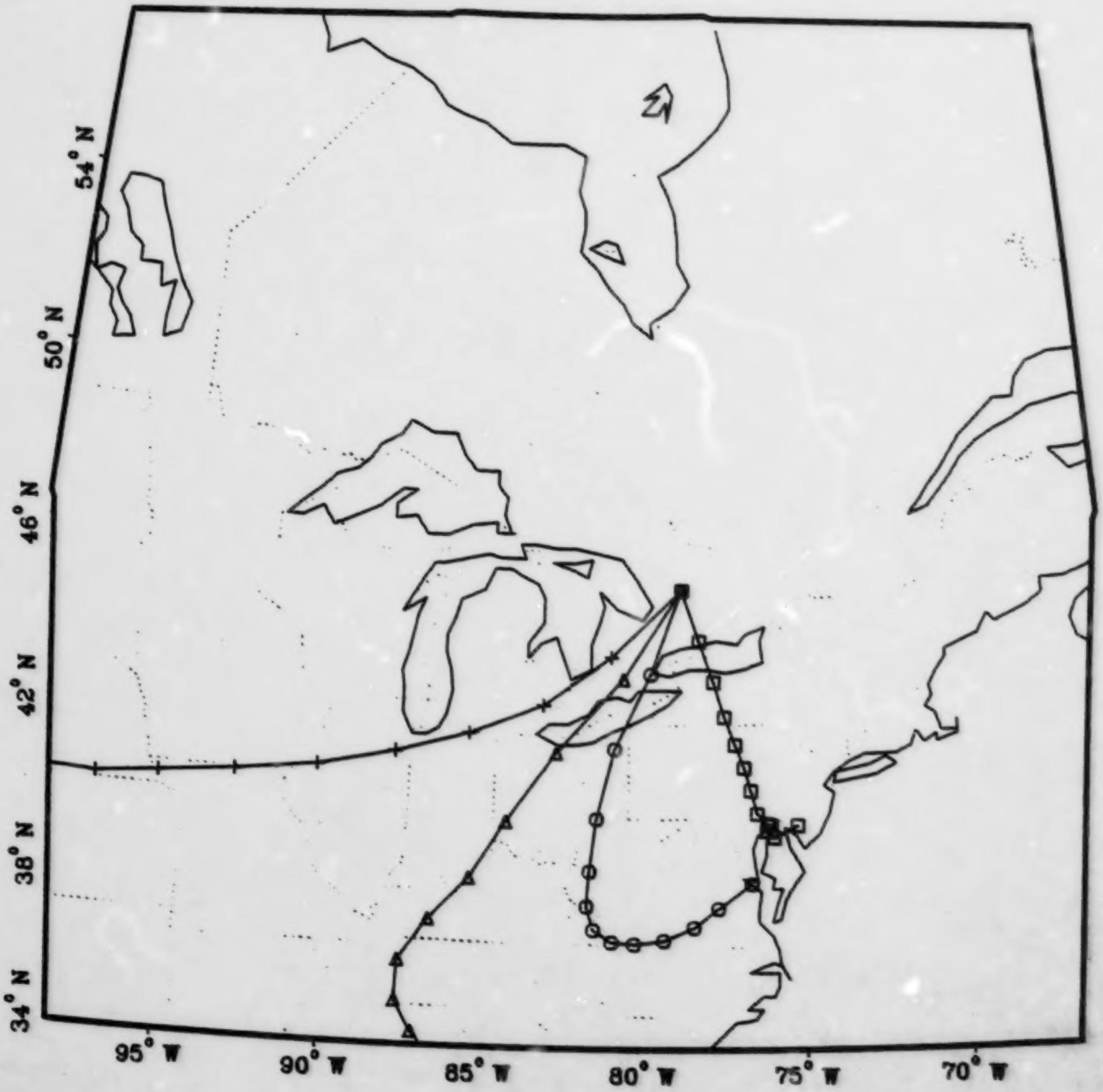

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.14.5

72 HOUR TRAJECTORIES
WED AUG 7 85 0 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

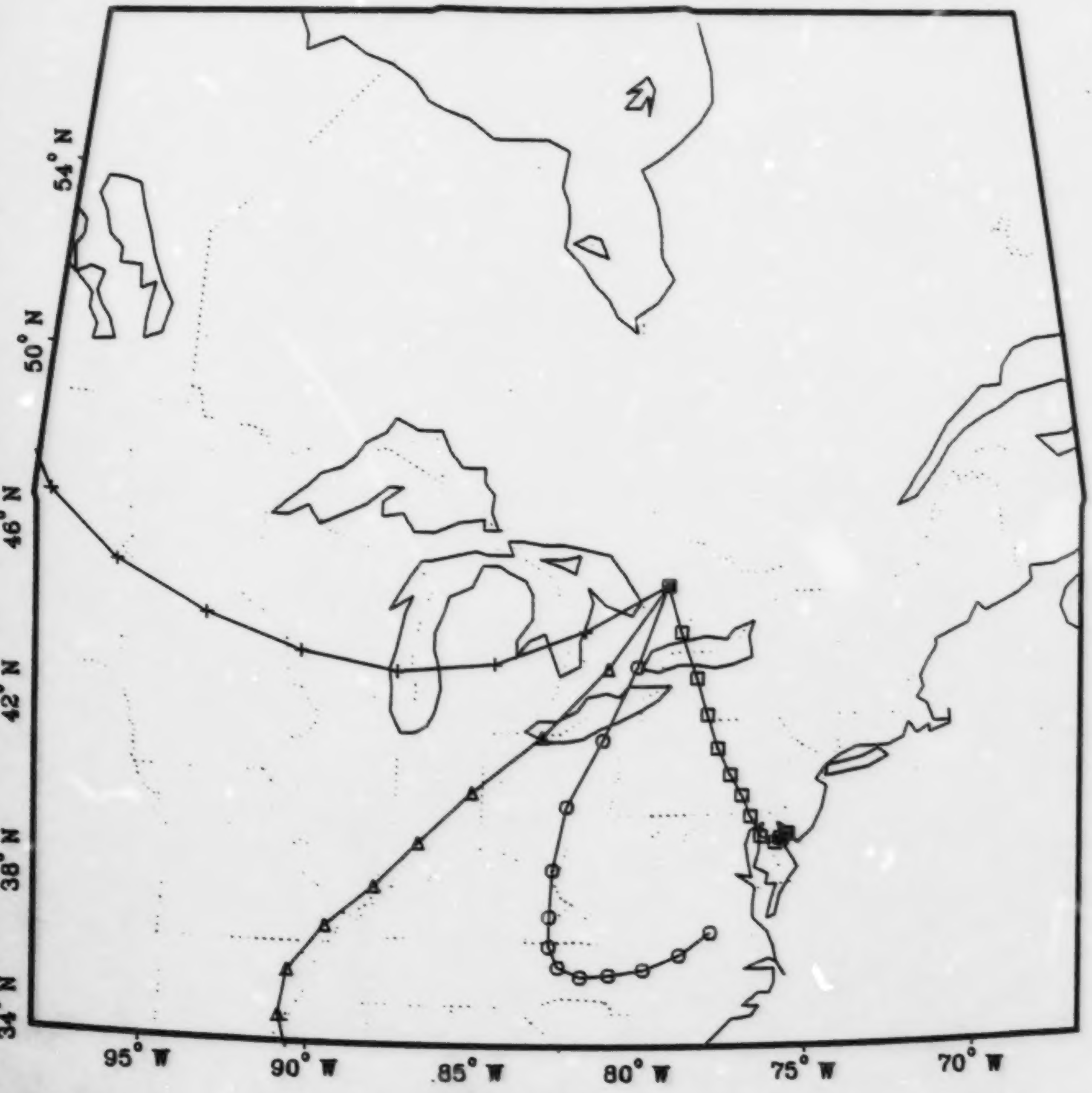

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.14.6

72 HOUR TRAJECTORIES
WED AUG 7 85 6 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □

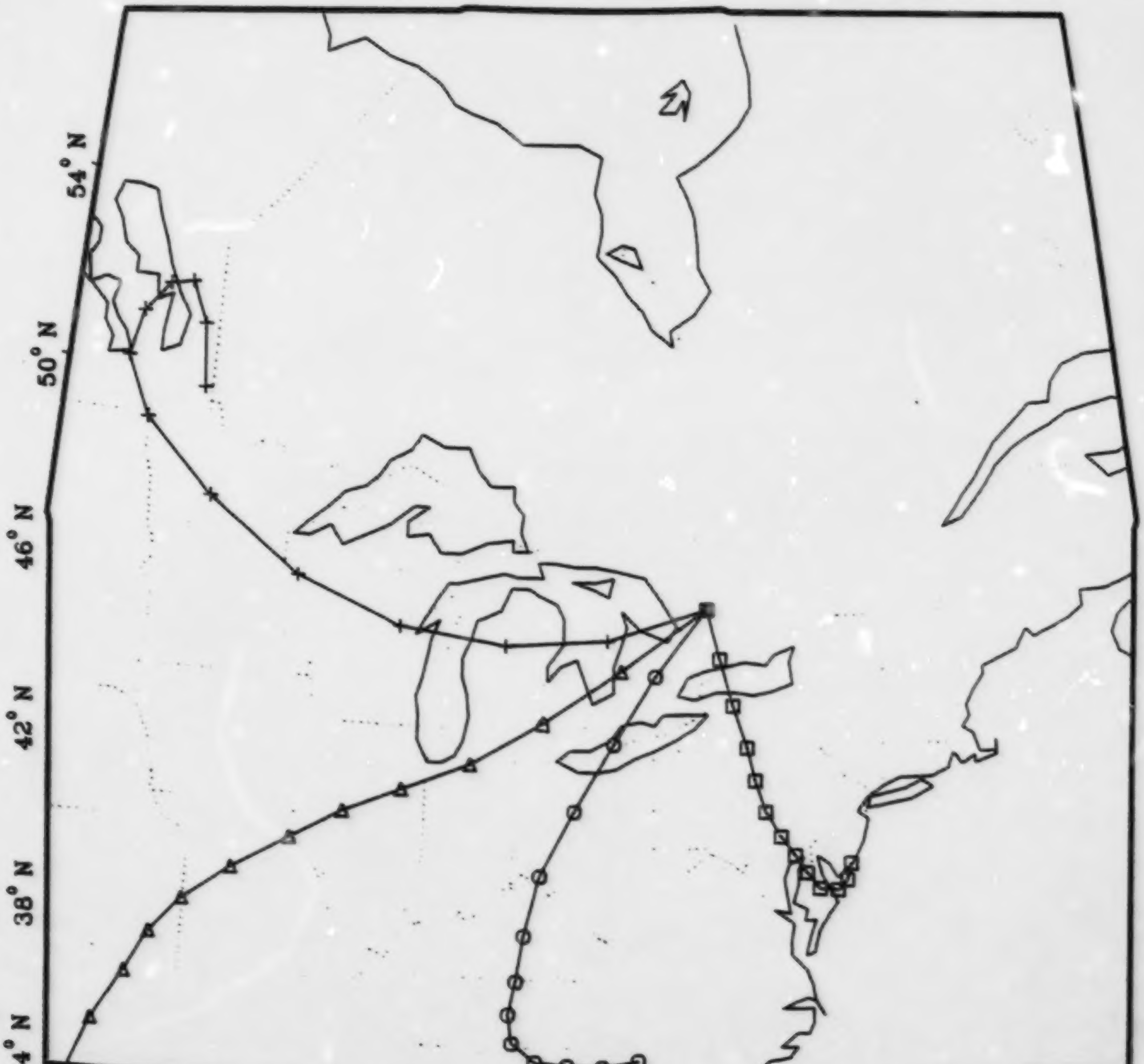

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.14.7

72 HOUR TRAJECTORIES
WED AUG 7 85 12 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

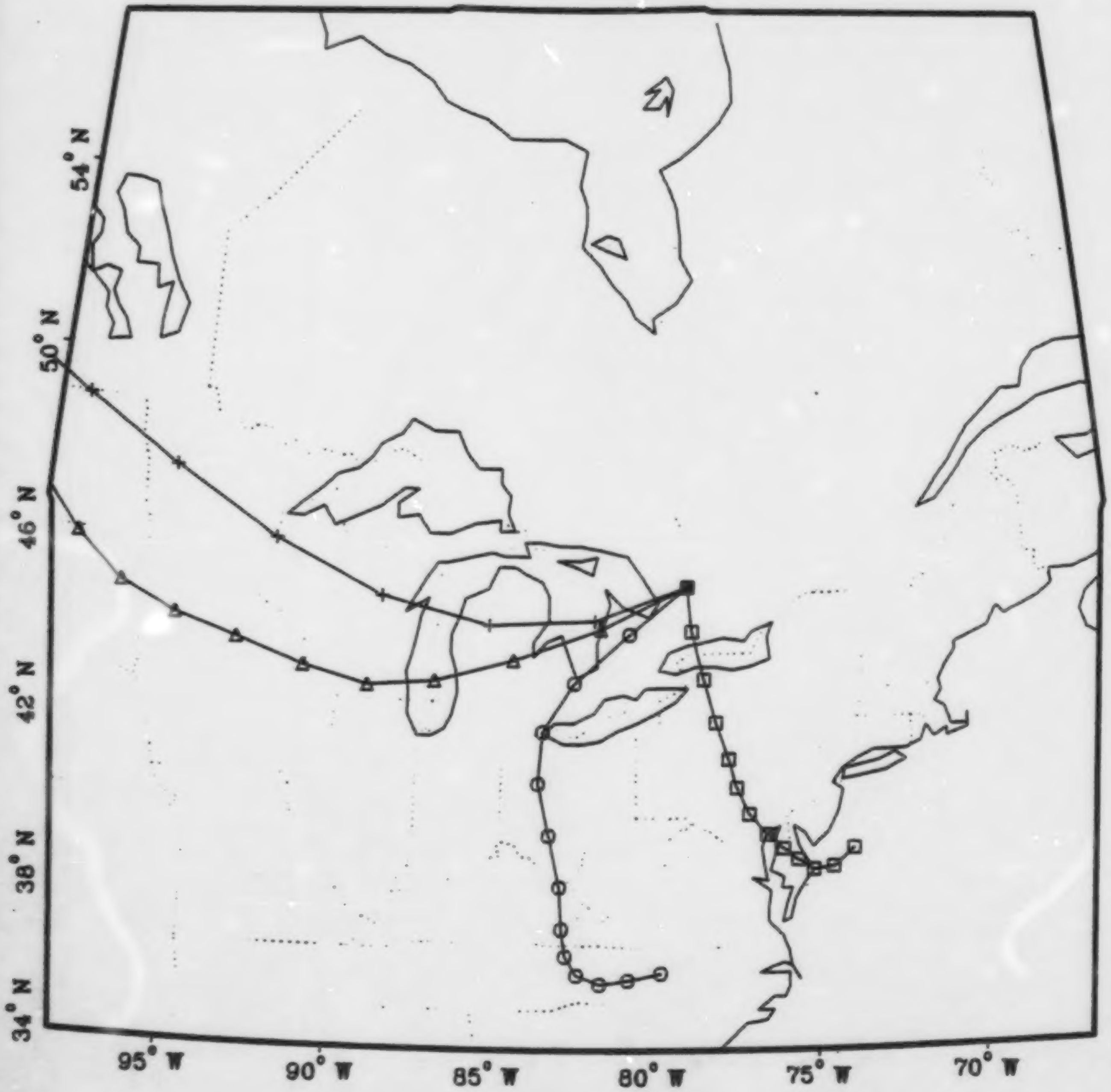

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.14.8

1.15 August 14-15, 1985, Longwoods (AES & MOE)

This event ranked last for both $SO_4^=$ (8/8) and NO_3^- (10/10) wet deposition events at Longwoods(AES). At Longwoods(MOE), the event ranked 7th (7/8) for $SO_4^=$ and last (10/10) for NO_3^- top 25% wet deposition episodes.

The synoptic conditions on August 14, at 12Z, were such that a stationary front lay in an E-W direction over Longwoods as shown in Fig. 1.15.1. A cold front over Sault Ste. Marie was also analyzed as shown in the figure. During this episode, the stationary front hovered around Longwoods and on August 15, at 12Z, it lay over Longwoods in a SW-NE direction as shown in Fig. 1.15.2. As shown in this figure, the cold front also now lay in a SW-NE direction over Lake Huron- Georgian Bay. The frontal system gave rise to showery weather and rain showers & thundershowers were observed as exhibited in Fig. 1.15.3. Lightning was observed for a few hours.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for August 14, at 12Z, 18Z and August 15, at 00Z, 06Z and 12Z are shown in Figures 1.15.4, 1.15.5, 1.15.6, 1.15.7 and 1.15.8 respectively.

Air parcels arriving at 1000 mb level could have carried SO_2 from the highest emission Detroit area, as shown in Figs. 1.15.4-8. NO_x from high emission Detroit area could also have been transported at this level.

Air trajectories for the 925 mb level show that SO_2 from the highest emission Chicago (see Figs. 1.15.4&5) and other area in Illinois(Figs 1.15.5-6) and NO_x from the highest emission Chicago area could have been transported.

Air trajectories for 850 mb and 700 mb levels are very similar. At these levels SO_2 from the highest emission Chicago area (see Figs. 1.15.4&5) and other area in Illinois and NO_x from the Chicago area could have been transported at these levels.

In summary, a stationary front hovered around the station throughout this episode giving rain showers and thundershowers for a few hours. Lightning was observed. SO_2 and NO_x transport from Chicago area at low(925 mb) and high (850 mb & 700 mb) levels, SO_2 from Detroit, Michigan, at low level(1000 mb), and other area in Illinois at low (925 mb) & high (850 mb & 700 mb) levels could have been transported during this episode.

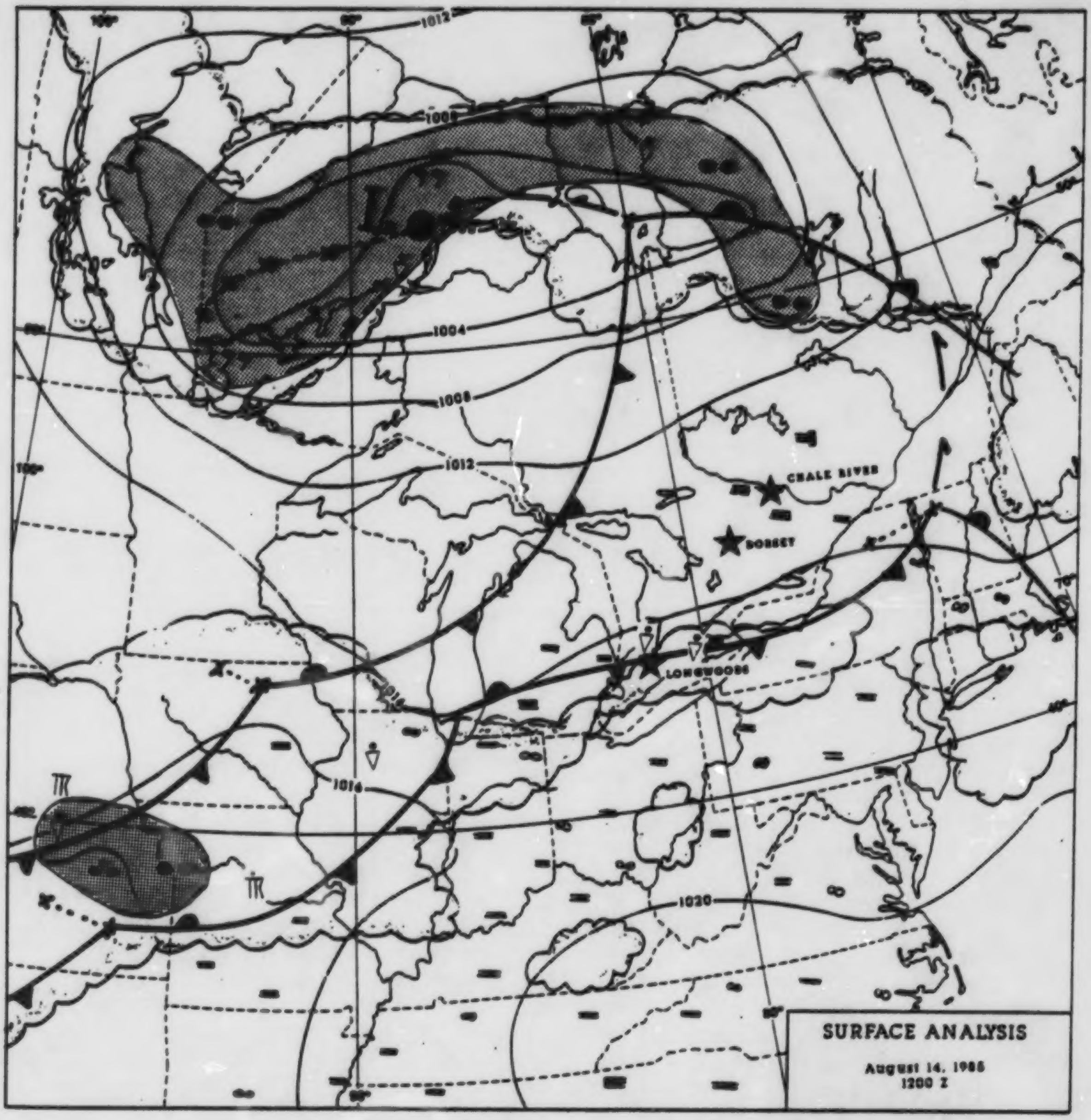

1012
1008
L
1004
1008
1012
1016
1016
1020
CHALK RIVER
DORSET
LONGWOODS
100°
90°
80°
70°
SURFACE ANALYSIS
August 14, 1985
1200 Z

FIGURE 1.15.1

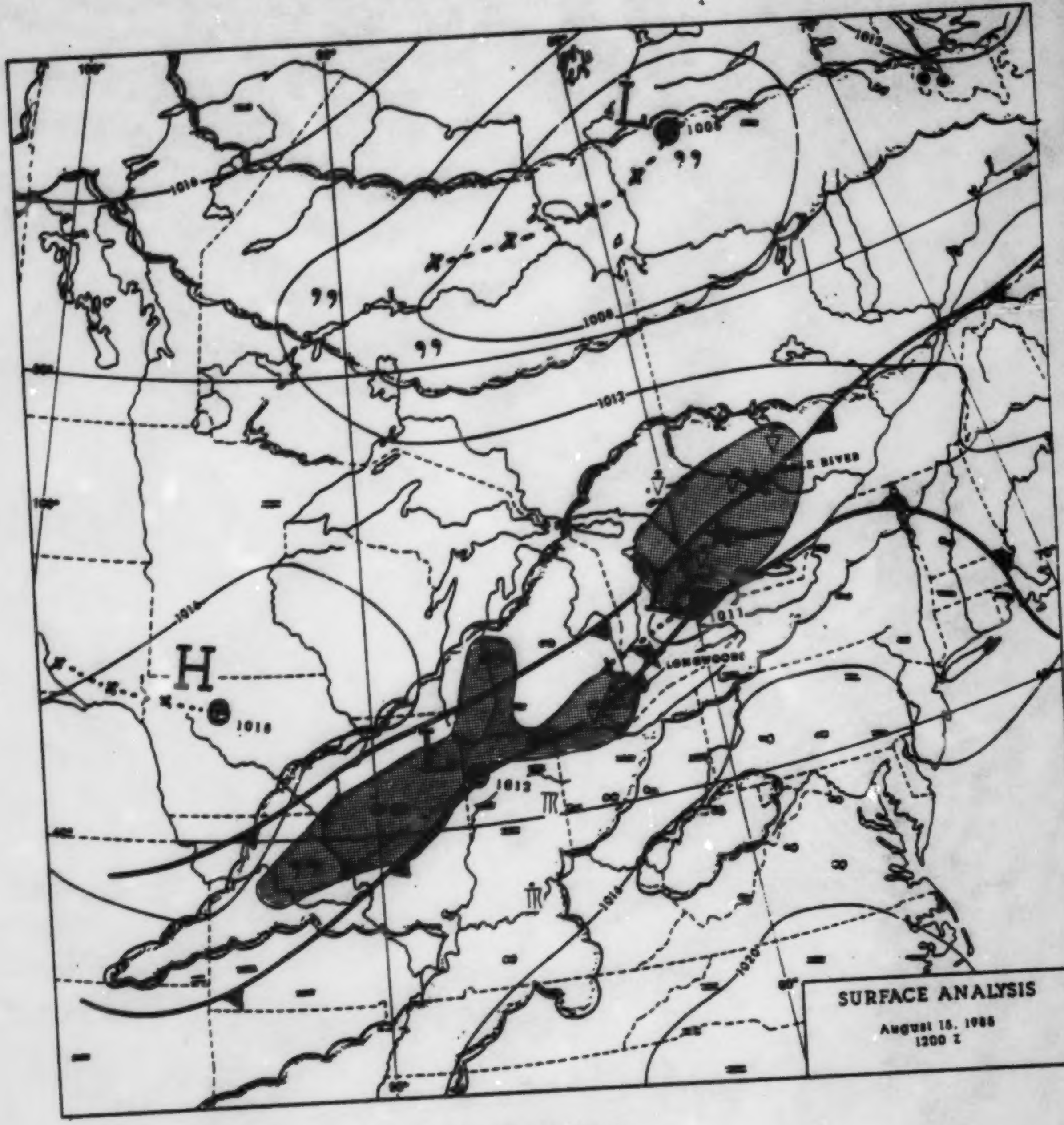
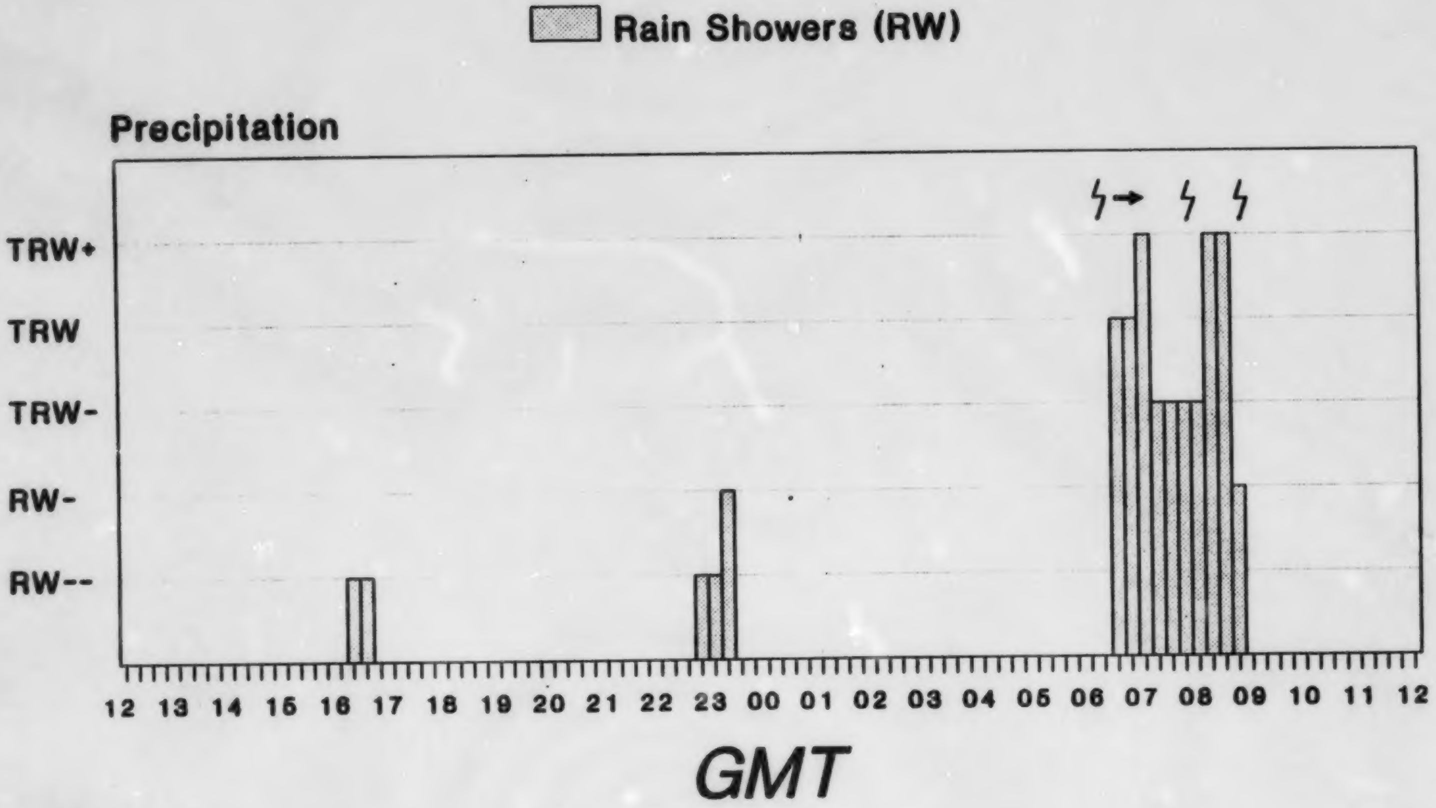

SURFACE ANALYSIS
August 15, 1985
1200 Z
H
L
1016
1012
1008
1020
LONGWOODS

FIGURE 1.15.2

London A
Aug. 14-15, 1985



T - Thunder

FIGURE 1.15.3

72 HOUR TRAJECTORIES
WED AUG14 85 12 Z

LONGWOODS (AES/MOE)

700MB	+
825MB	Δ
925MB	○
1000MB	□

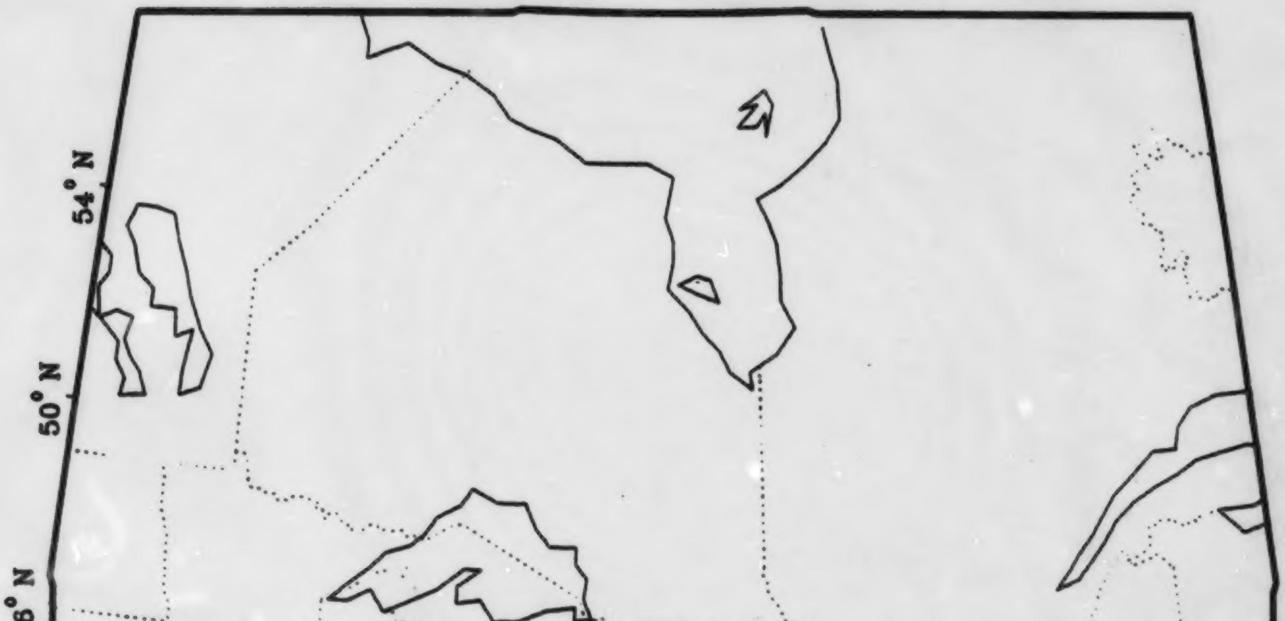
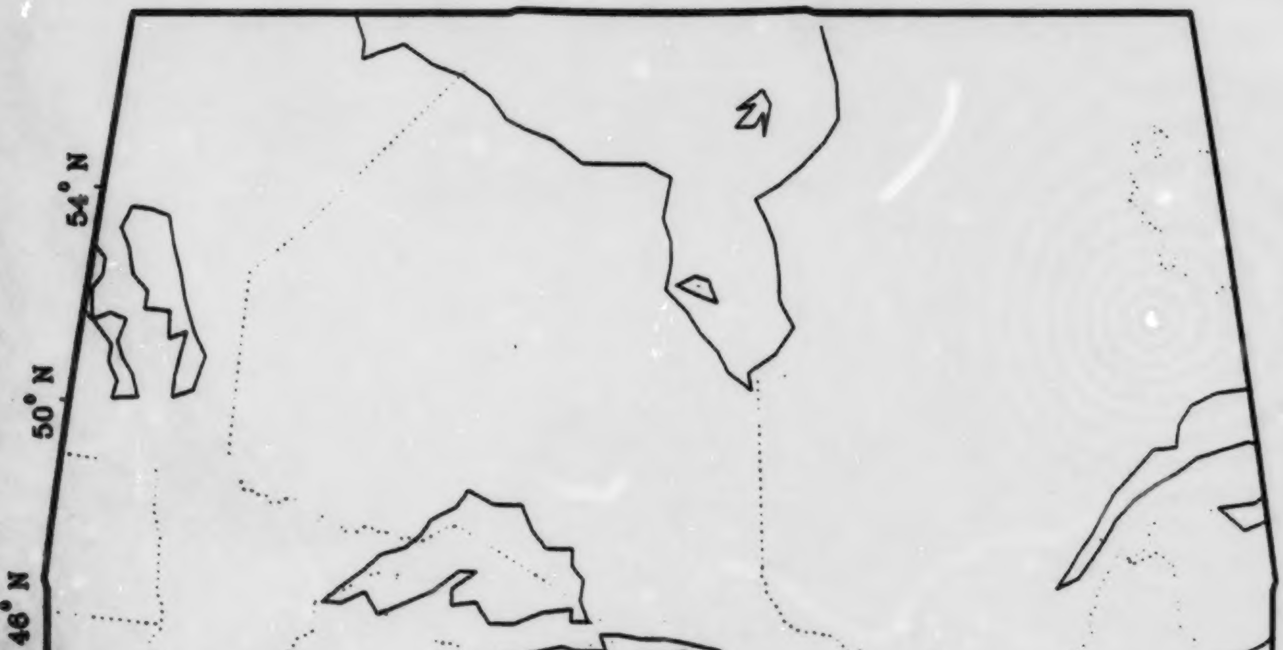

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.15.4

72 HOUR TRAJECTORIES
WED AUG14 85 18 Z

LONGWOODS (AES/MOE)

700MB +
825MB Δ
925MB ○
1000MB □



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.15.5

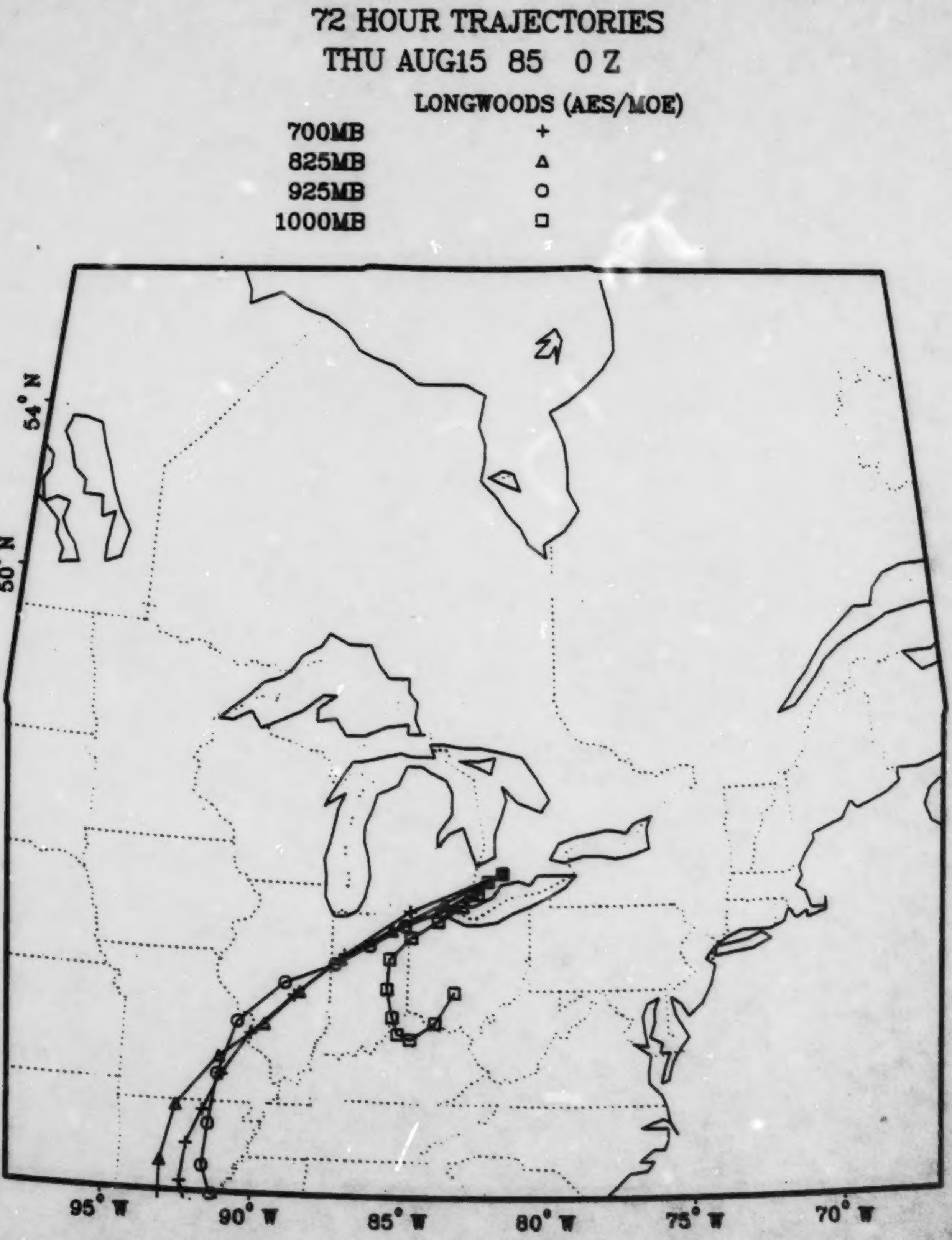

72 HOUR TRAJECTORIES
THU AUG15 85 0 Z
LONGWOODS (AES/MOE)
700MB +
825MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.15.6

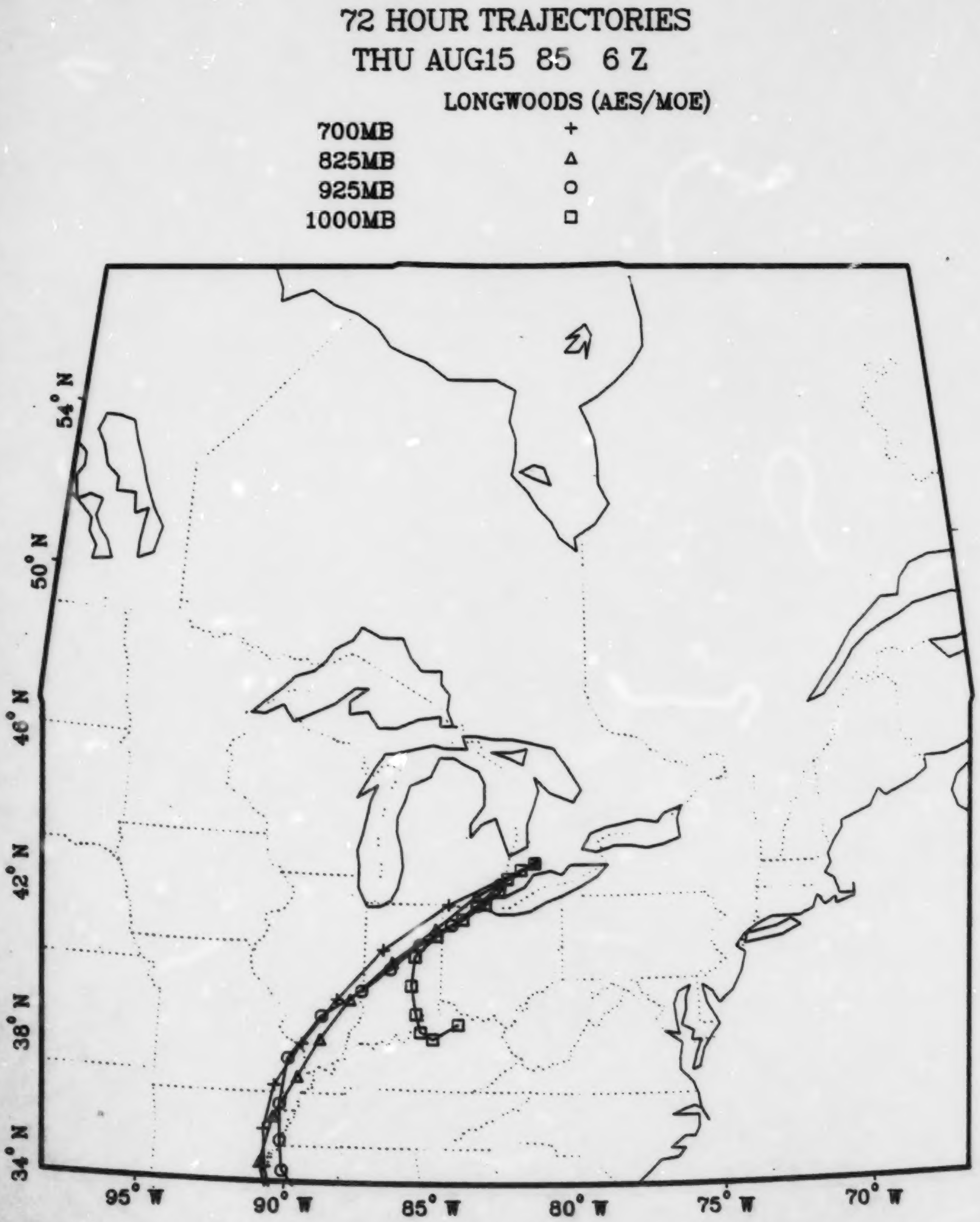

72 HOUR TRAJECTORIES
THU AUG15 85 6 Z
LONGWOODS (AES/MOE)
700MB +
825MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.15.7

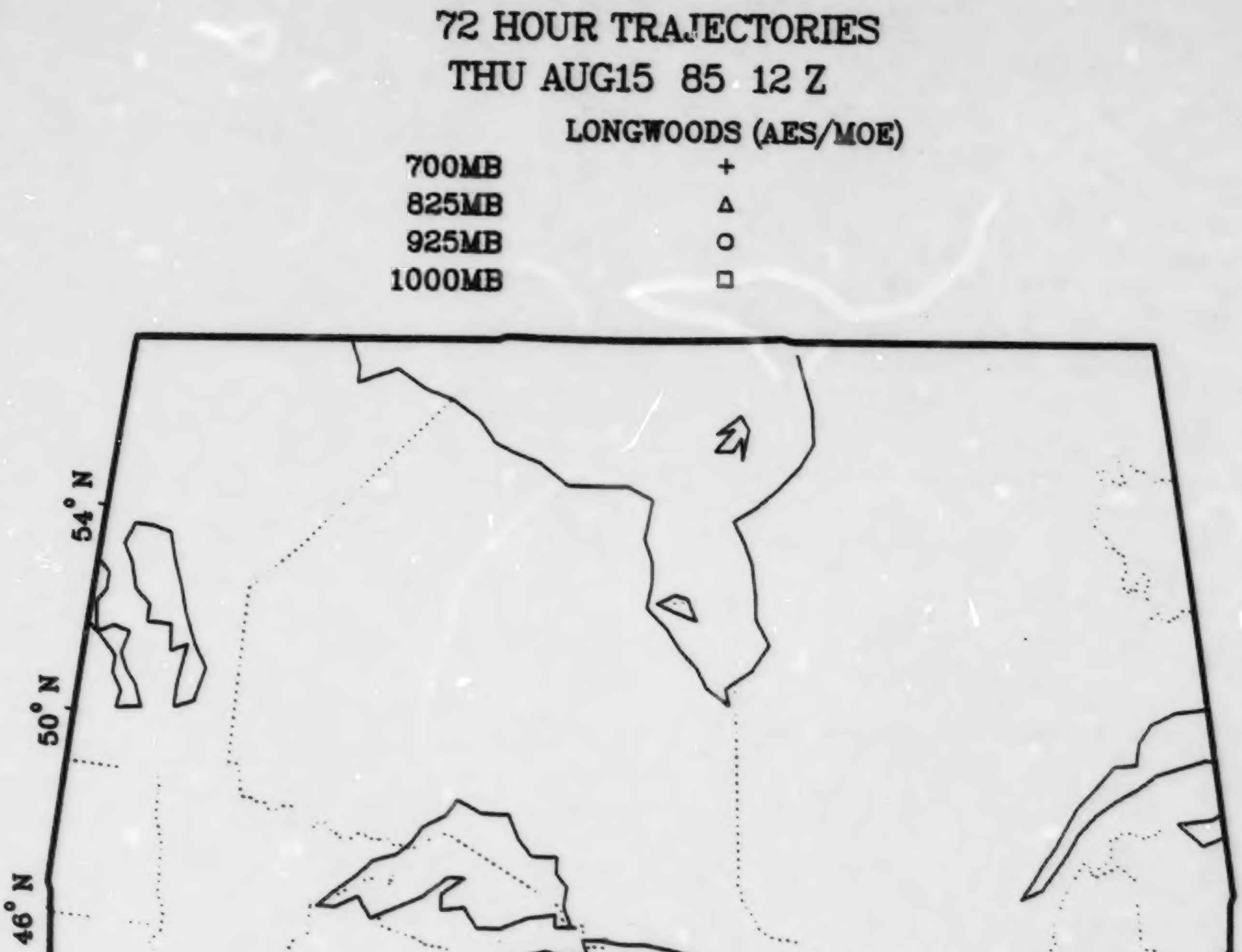

72 HOUR TRAJECTORIES
THU AUG15 85 12 Z
LONGWOODS (AES/MOE)
700MB +
825MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.15.8

1.16 August 18-19, 1985 Dorset & Chalk River

This event is recorded at two stations. At Dorset, it ranked 1st (1/8) for SO_4^- and 3rd (3/12) for NO_3^- . At Chalk River it was again the top ranking event for SO_4^- (1/5) and second (2/7) in rank for NO_3^-. Separate narratives for Dorset and Chalk River are as follows:

Dorset

A wave over northern Ontario near Chapleau with associated frontal system such that the warm front lay in a NW-SE direction west of Dorset and a trowl associated with a low pressure centre over Michigan near Lansing with frontal system, as shown in Fig. 1.16.1, was analyzed on August 18, at 12Z. During this episode, first the warm front, then the trowl and in the last the cold front associated with the wave passed over Dorset to lie east of the station on August 19, at 12Z, as shown in Fig. 1.16.2. The passages of trowl and cold front yielded showery weather and showers and thunder showers were recorded at the nearby weather station Muskoka A, as illustrated in Fig. 1.16.3A. The warm front did not give rise to significant precipitation.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for August 18, at 12Z, 18Z and August 19, at 00Z, 06Z and 12Z are shown in Figures 1.16.4, 1.16.5, 1.16.6, 1.16.7 and 1.16.8 respectively.

Air parcels arriving at 1000 mb level did not pass over any highest emission areas of SO_2 and NO_x and therefore any pollution transport at this level would be of minor importance.

Air trajectories for the 925 mb level show that SO_2 from the highest emission areas in Pennsylvania-West Virginia-Ohio states (see Figs. 1.16.6&7), Chicago and other area in Illinois (see Fig. 1.16.8) and NO_x from its highest emission Chicago area (Fig. 1.16.8) could have been transported at this level.

Air parcels arriving at 850 mb level could have carried SO_2 from the highest emission areas in Ohio-Pennsylvania-West Virginia (Fig. 1.16.5&6) and Detroit, Michigan, region(Fig. 1.16.7). Transport of NO_x from high emission regions in these states was also likely. Transport of these pollutants from the Chicago area for a short time was also possible on August 19, between 06 and 12Z, as illustrated by veering of the trajectory during this period (see Figs. 1.16.7-8).

Air parcels arriving at 700 mb level could have carried SO_2 and NO_x from the highest emission Chicago (Fig 1.16.4&6) area.

In summary, a passage of trowl and cold front yielded rain showers and thundershowers at Dorset. Transport of SO_2 from the Chicago area at low (925 mb) and high levels(700 mb and possibly 850 mb), from Pennsylvania-Ohio-West Virginia at low (925 mb) and high (850 mb) levels, from Illinois at low level (925 mb) and from Detroit, Michigan area at high level (850 mb) was likely. Transport of NO_x at low (925 mb) and high (700 mb & possibly 850 mb) levels from the Chicago area and high emission areas in Detroit, Michigan and Ohio-Pennsylvania-West Virginia was also probable during this event.

1.16 August 18-19, 1985, continued

Chalk River

The system which affected Dorset also affected Chalk River a few hours later.

A wave over northern Ontario near Chapleau with associated frontal system such that the warm front lay in a NW-SE direction west of Dorset and a trowl associated with a low pressure centre over Michigan near Lansing with frontal system was observed on August 18, at 12Z, as shown in Fig. 1.16.1. As for Dorset discussed earlier, firstly the warm front, then the trowl and lastly the cold front passed over Chalk River to lie just east of the station on August 19, at 12Z, as shown in Fig. 1.16.2. The passages of trowl and cold front yielded showery weather and showers and thunder showers were recorded at the nearby weather station Petawawa A, as illustrated in Fig. 1.16.3B. Lightning was also observed for a few hours. The warm front passage did not give rise to any precipitation.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for August 18, at 12Z, 18Z and August 19, at 00Z, 06Z and 12Z are shown in Figures 1.16.9, 1.16.10, 1.16.11, 1.16.12 and 1.16.13 respectively.

Air trajectories for 1000 mb level show that SO_2 from the highest emission Sudbury area could have been transported during many hours as illustrated in Figs. 1.16.9-11.

Air trajectories for 925 mb level show that SO_2 from the highest emission areas in Pennsylvania could have been transported as shown in Fig. 1.16.13. NO_x from the high emission areas in Pennsylvania would also have been carried to the station.

Air parcels arriving at 850 mb level could have carried SO_2 from the highest emission areas in Ohio-Pennsylvania-West Virginia (see Figs. 1.16.11-12) and from Chicago area (Fig. 1.16.13). NO_x from the Chicago area could also have been brought. It is also apparent that SO_2 from the highest emission Detroit area could also have been transported for a few hours as the trajectories backed as shown in Figs. 1.16-10-11.

Air trajectories for 700 mb level first backed and then veered resulting in possible transport of SO_2 and NO_x from the Chicago area on Aug. 18, between 12Z and 18Z (see Figs. 1.16.9-10) and on Aug. 19, at 06Z as shown in Fig. 1.16.12. SO_2 from the Illinois area (Fig. 1.16.10) and Detroit area (Fig. 1.16.10-11) could also have been transported. Pollution transport from other high emission areas was also probable.

In summary, passage of a trowl and cold front yielded rain and thunder showers. Lightning was observed. Transport of SO_2 at low levels from the Sudbury area(at 1000 mb) and Pennsylvania areas (at 925 mb) and at high levels from Ohio-Pennsylvania-West Virginia (at 850 mb), from the Chicago (850 mb & 700 mb) and other Illinois areas (700 mb), and possibly Detroit area (850 mb & 700 mb) and of NO_x at high levels from Chicago area(850 mb & 700 mb) was likely. Pollution transport from other high emission regions was also probable.

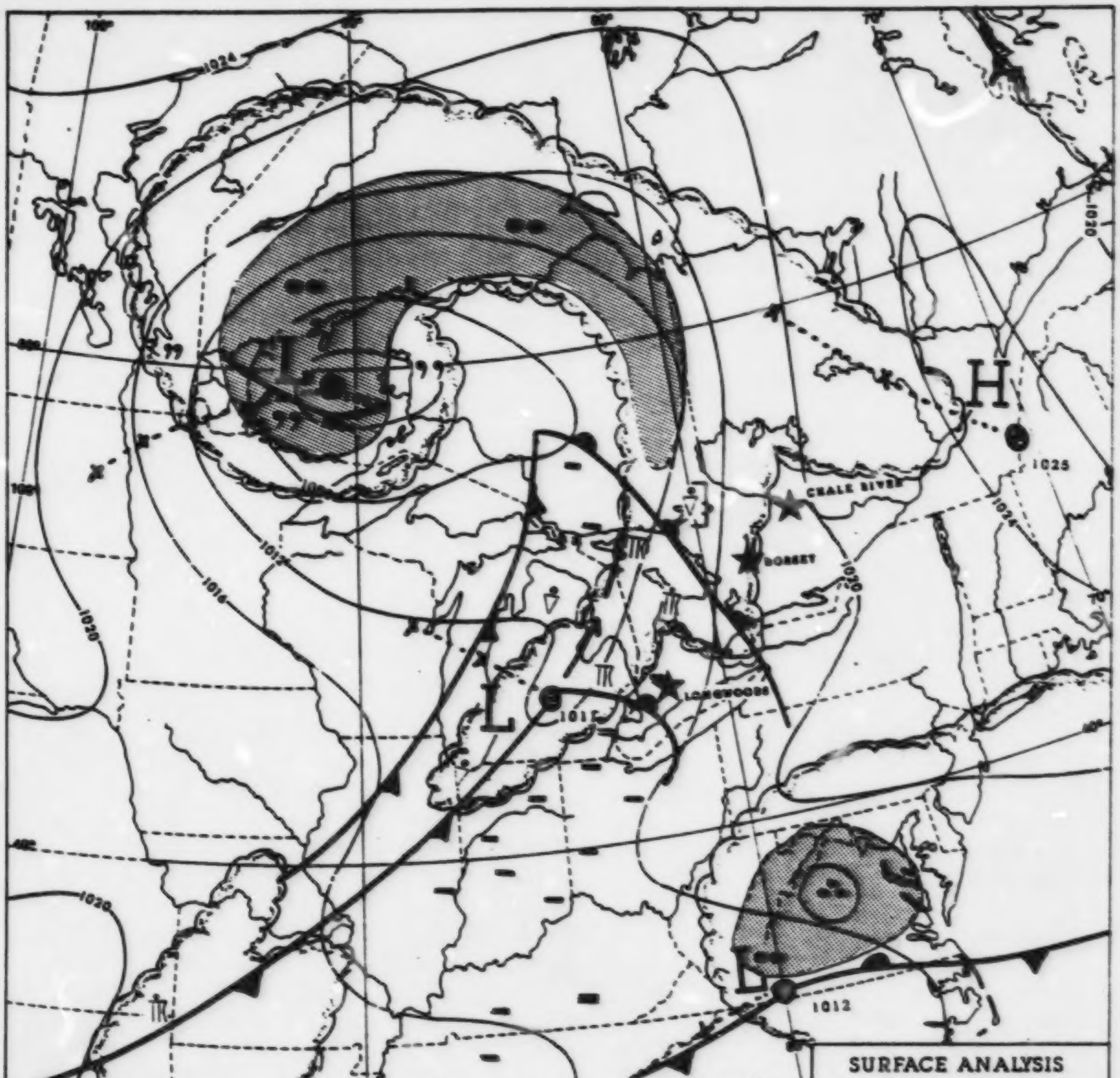

H
L
L
L
1024
1020
1016
1012
1025
1012
1020
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
August 18, 1985
1200 Z

FIGURE 1.16.1

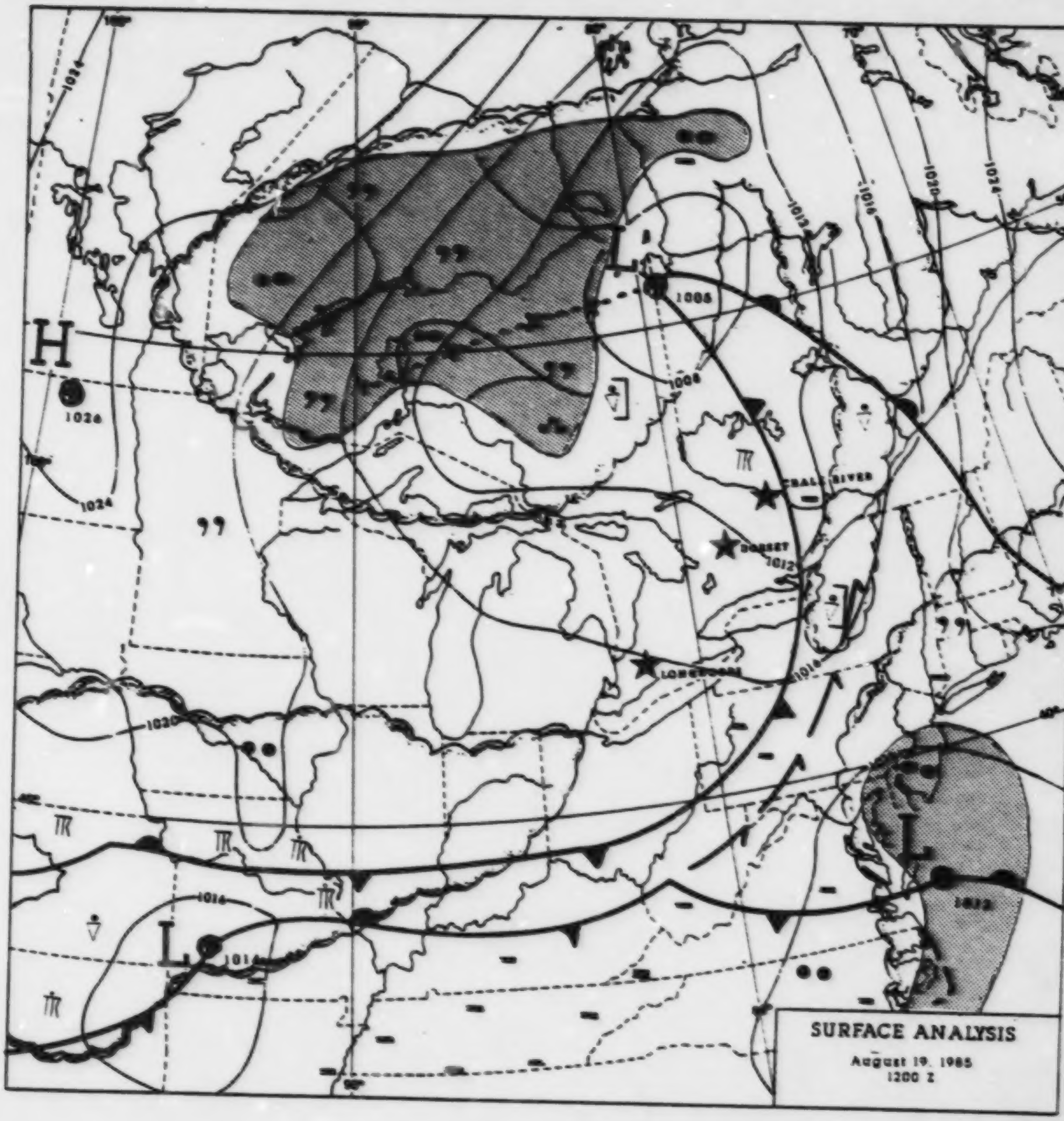

SURFACE ANALYSIS
August 19, 1985
1200 Z
H
L
L
L
1026
1024
1024
1020
1016
1016
1012
1012
1008
1008
1016
1020
1024
1016
1014
1012
CHALK RIVER
DORSET

FIGURE 1.16.2

Muskoka A

Aug. 18-19, 1985

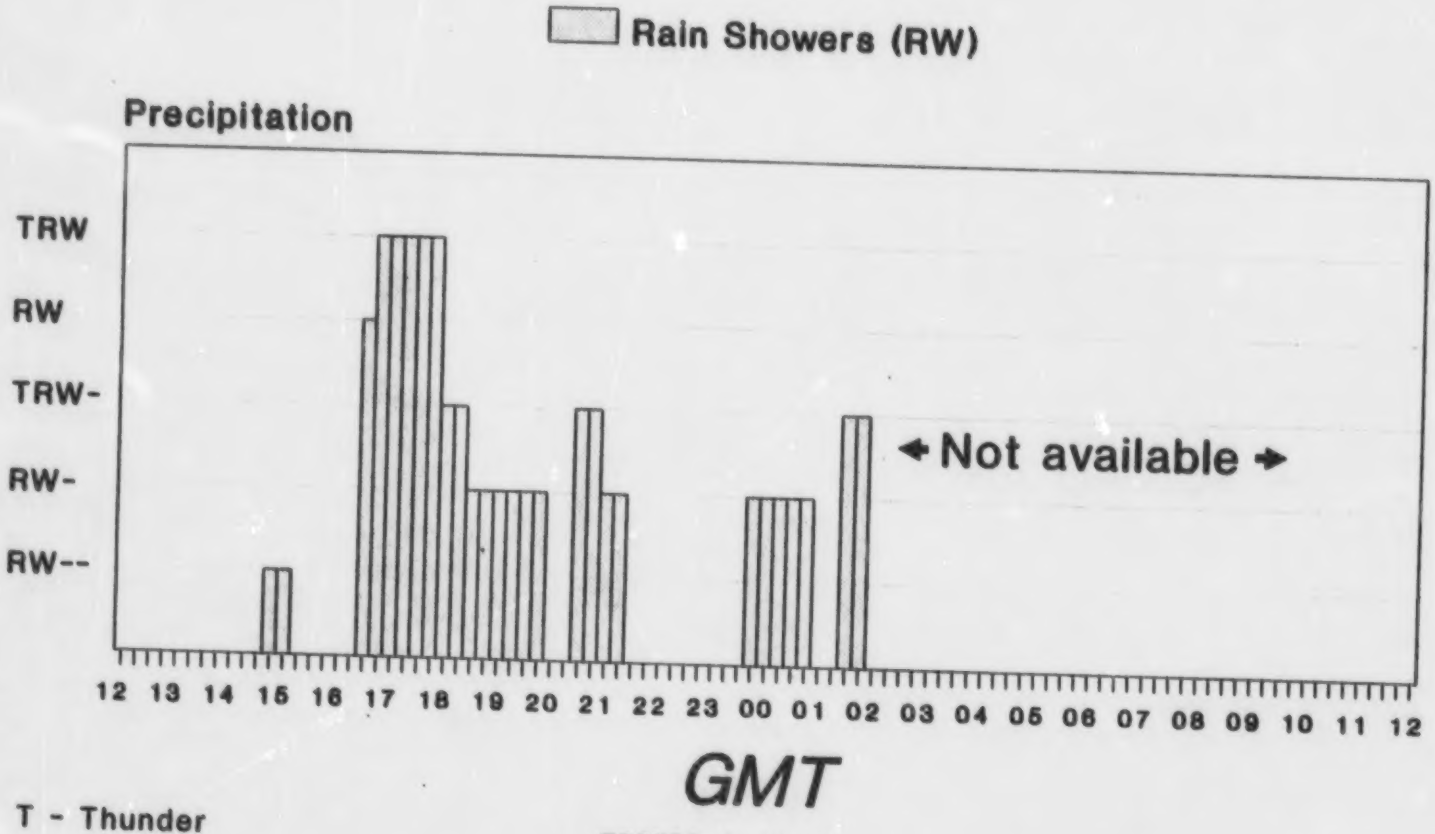
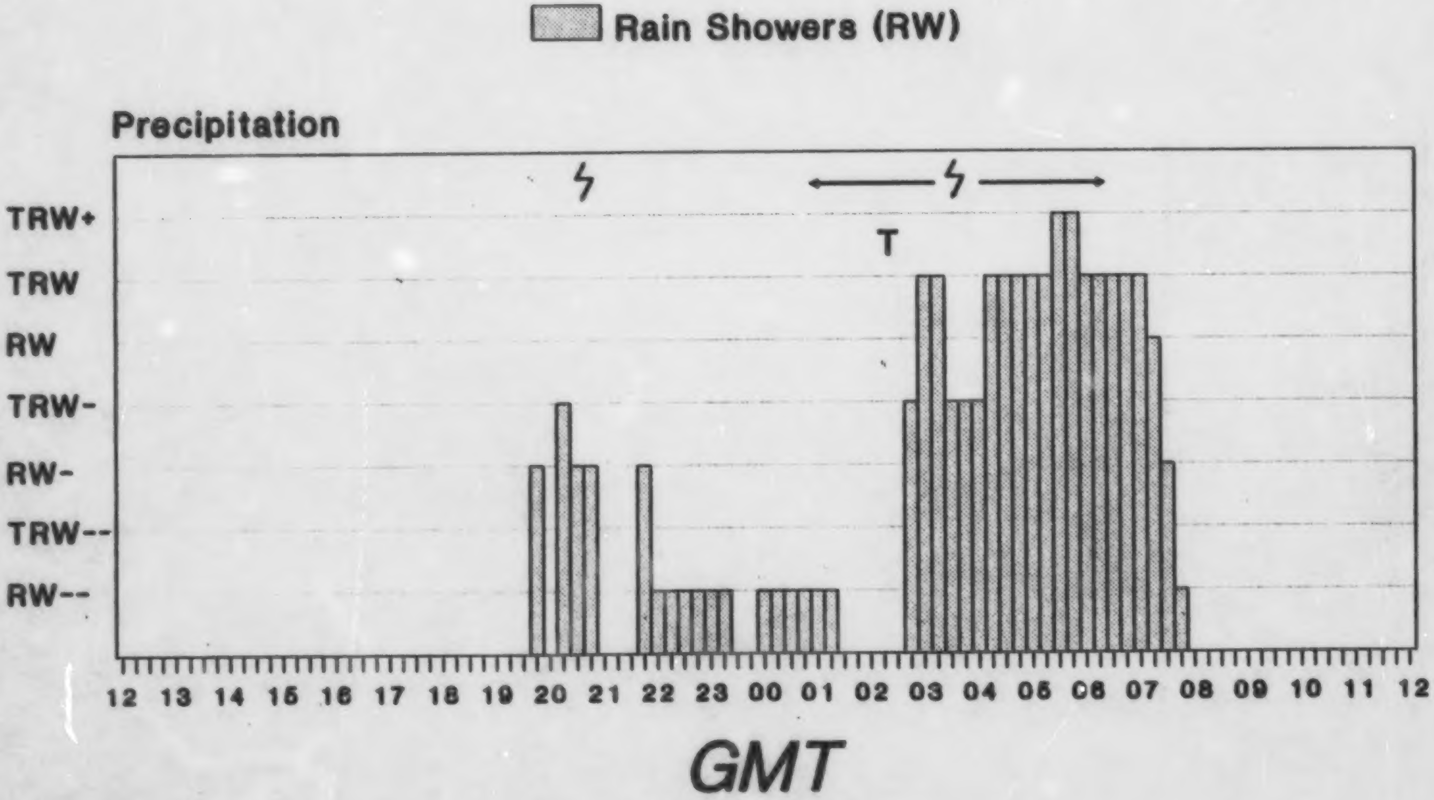


FIGURE 1.16.3A

Petawawa A

Aug. 18-19, 1985



T - Thunder

FIGURE 1.16.3B

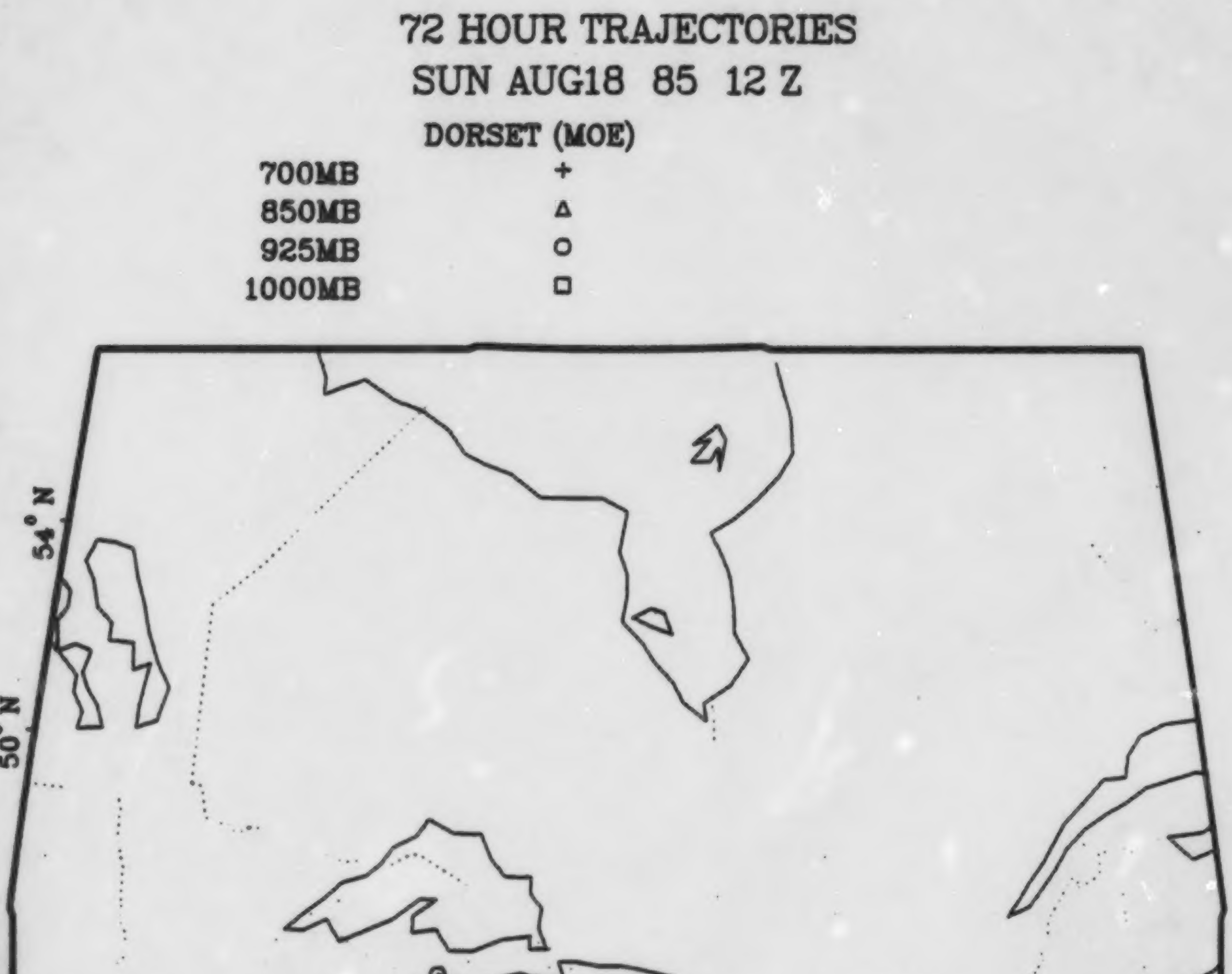

72 HOUR TRAJECTORIES
SUN AUG18 85 12 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.4

72 HOUR TRAJECTORIES
SUN AUG18 85 18 Z
DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

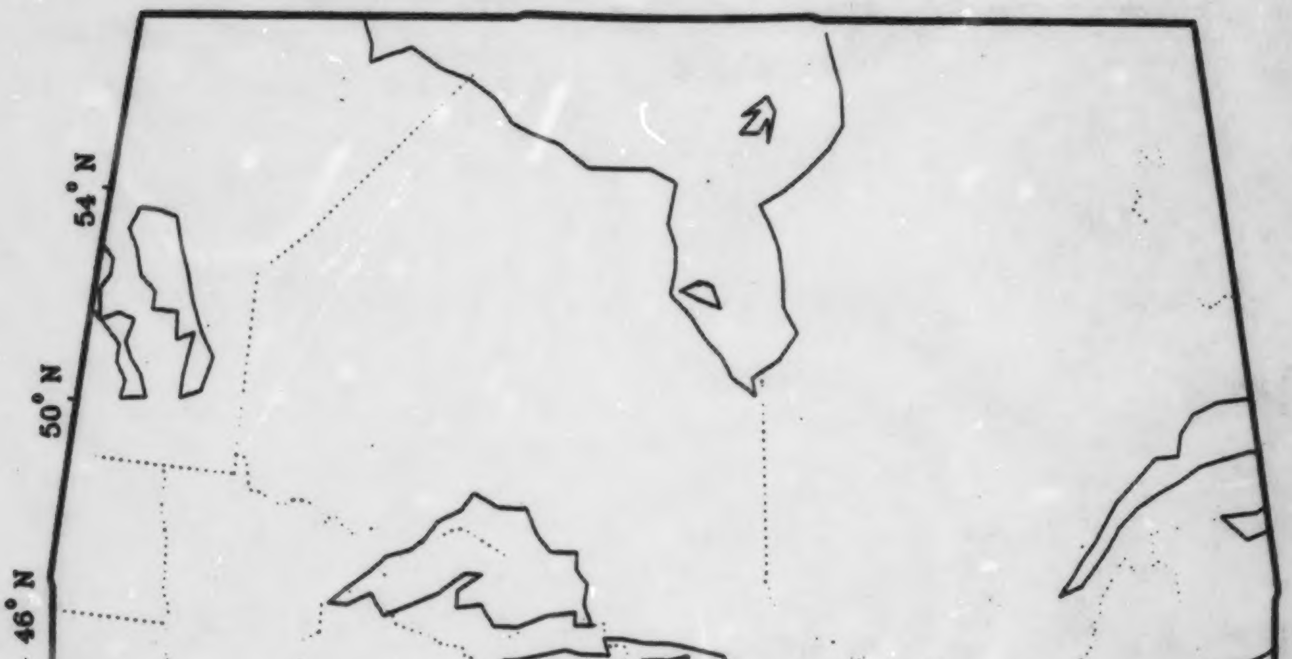

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.5

72 HOUR TRAJECTORIES
MON AUG19 85 0 Z
DORSET (MOE)

700MB +
850MB △
925MB ○
1000MB □

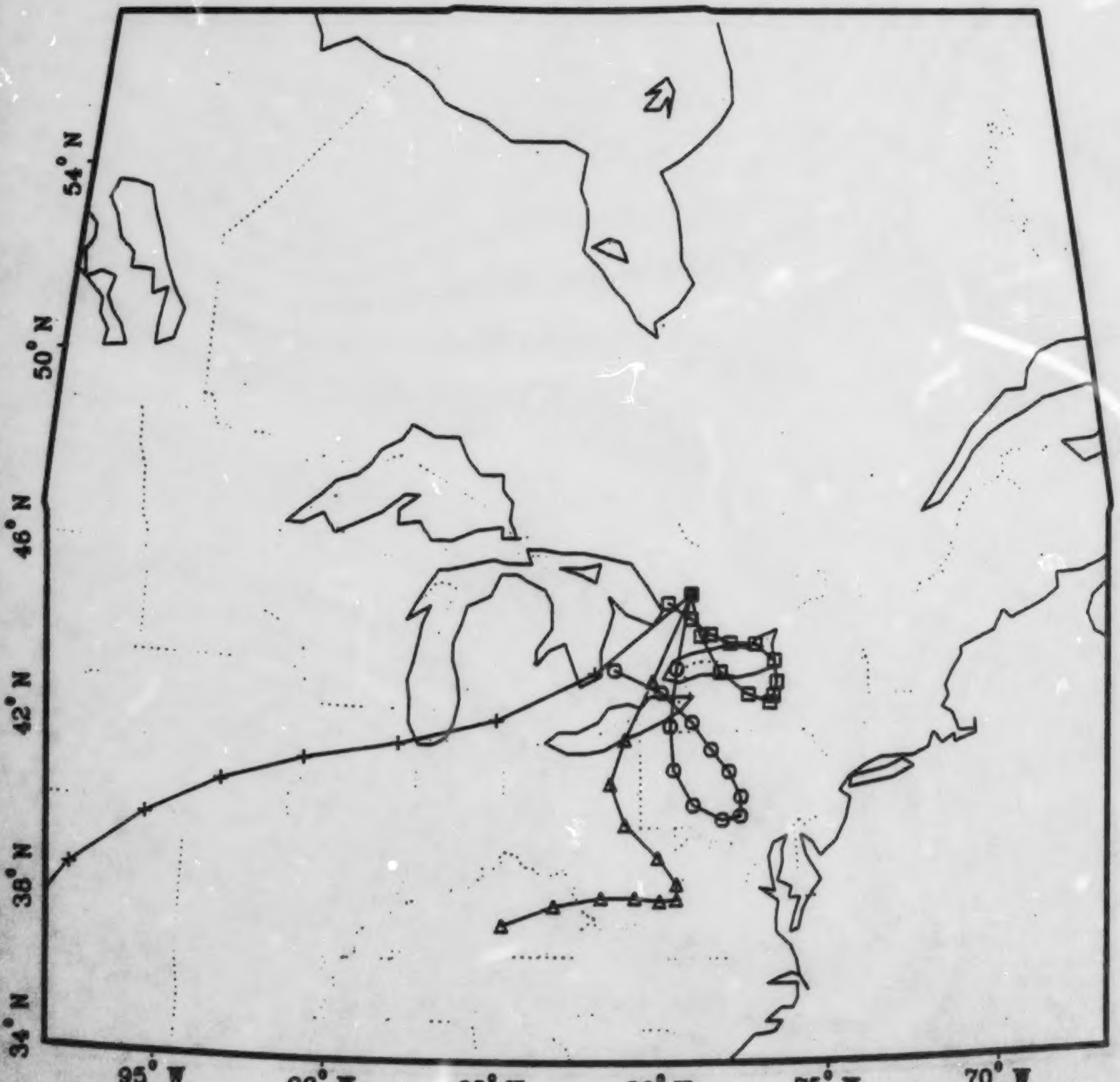

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.6

72 HOUR TRAJECTORIES
MON AUG19 85 6 Z
DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

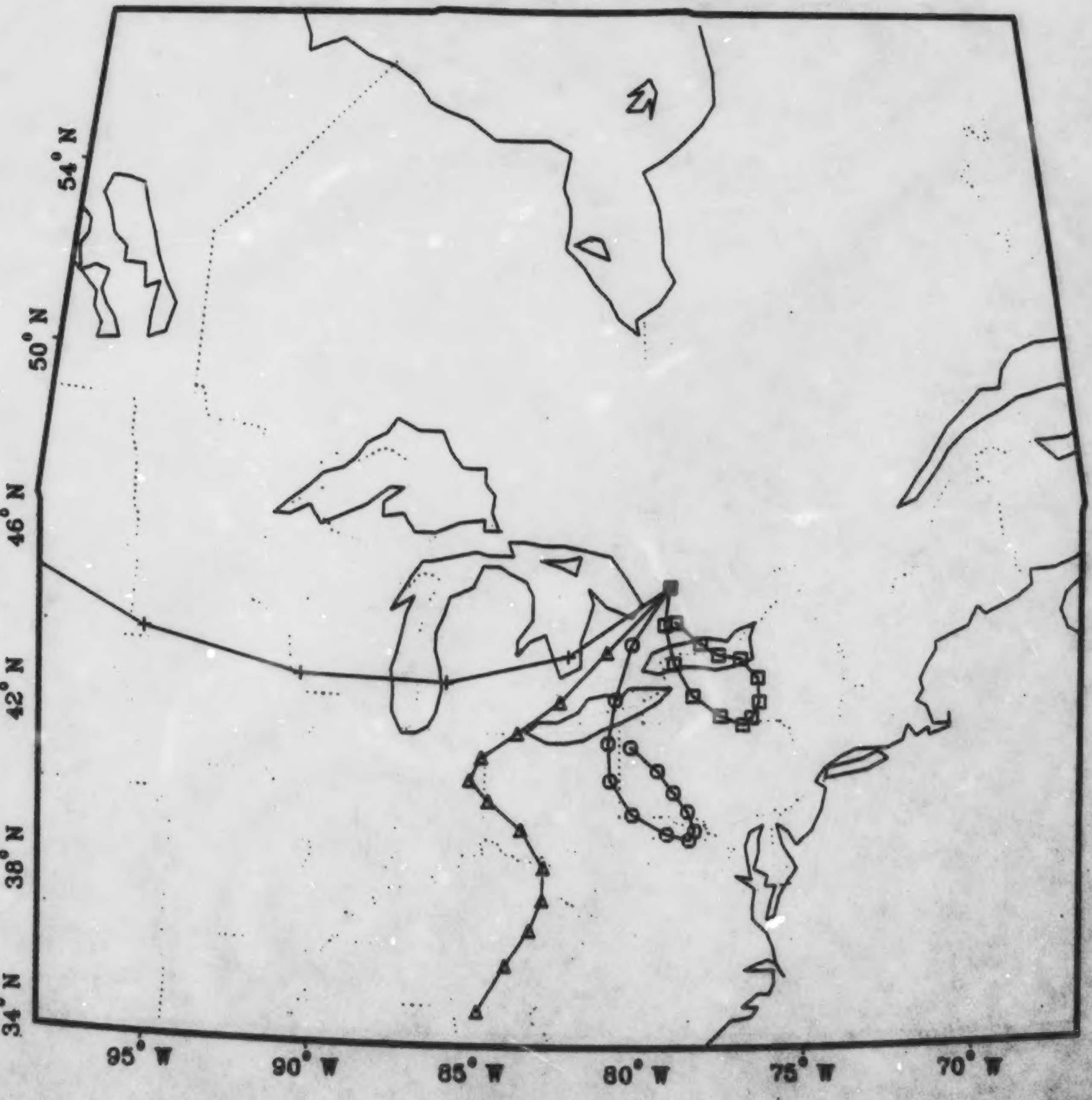

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.7

72 HOUR TRAJECTORIES
MON AUG19 85 12 Z
DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

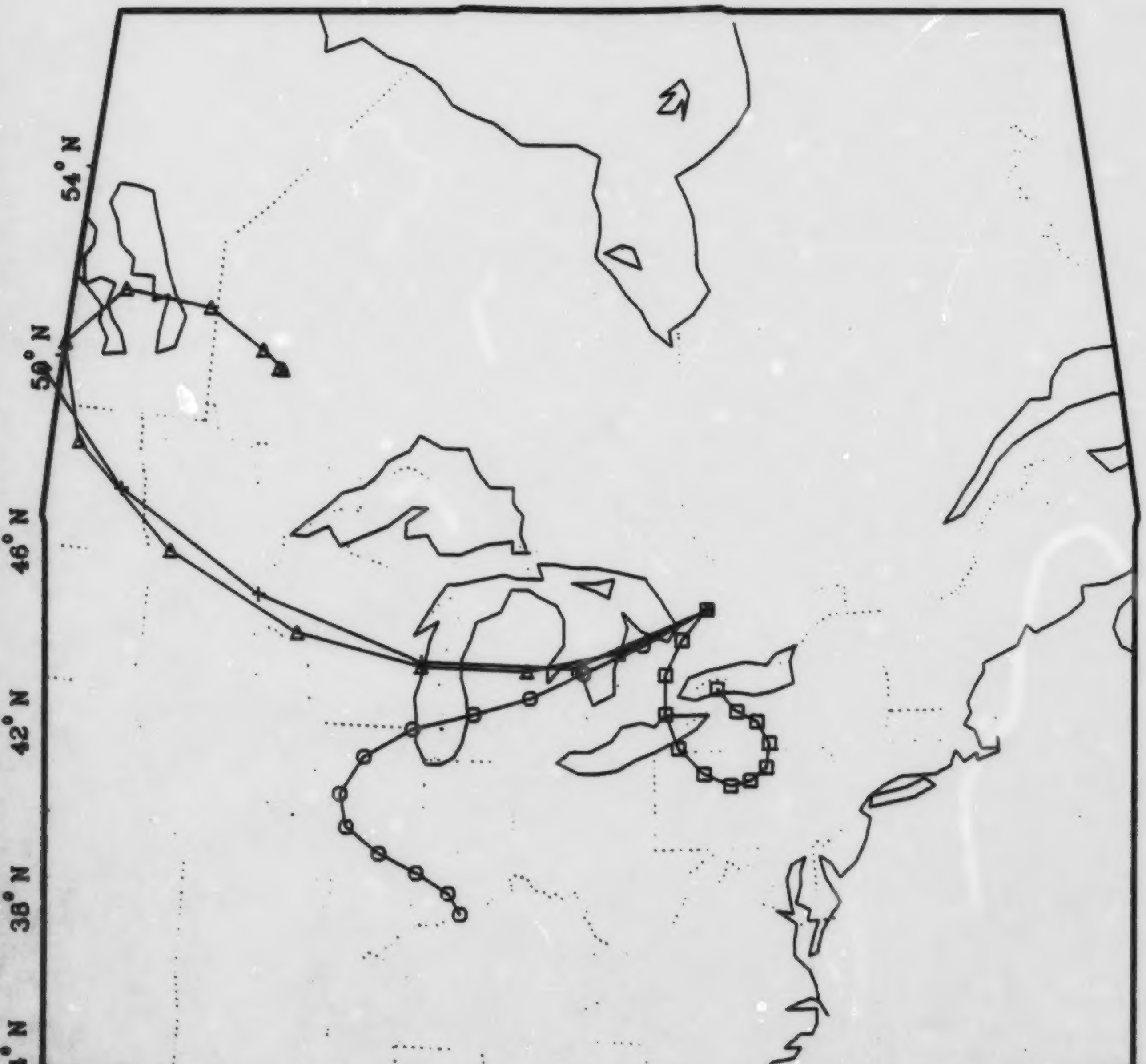
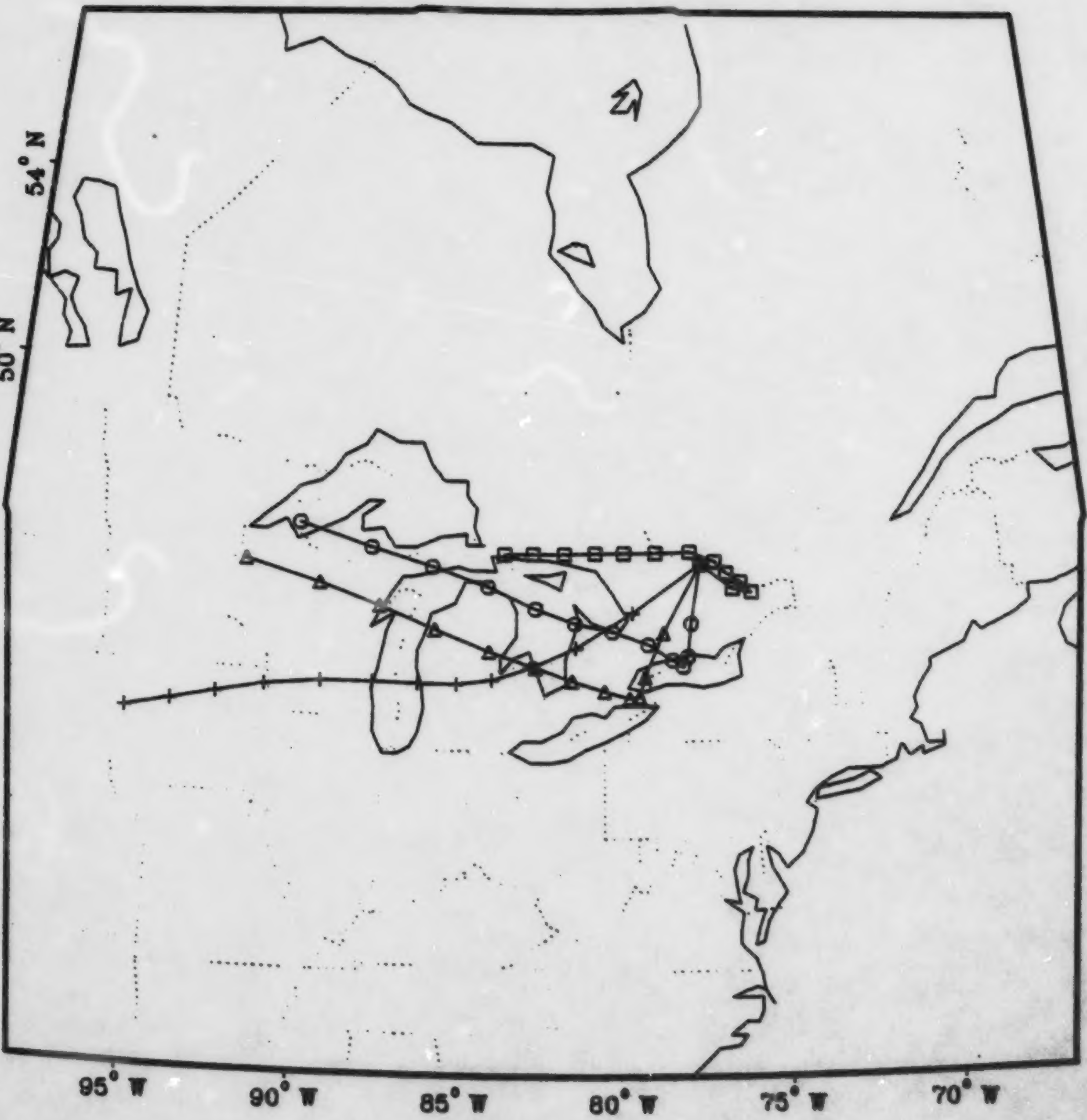

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.8

72 HOUR TRAJECTORIES
SUN AUG18 85 12 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.9

72 HOUR TRAJECTORIES
SUN AUG18 85 18 Z

CHALK RIVER (AES)

700MB +
850MB △
925MB ○
1000MB □

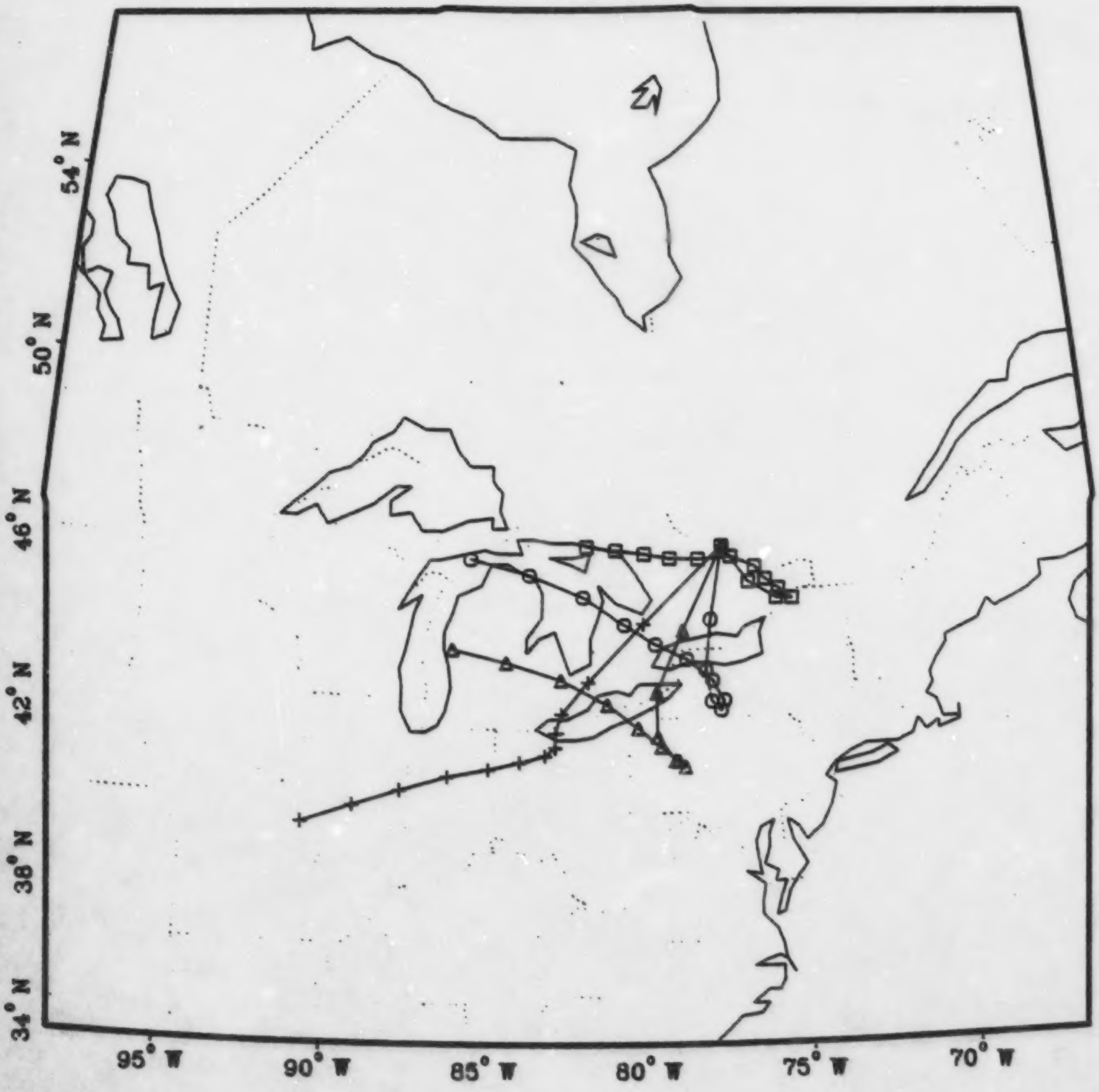
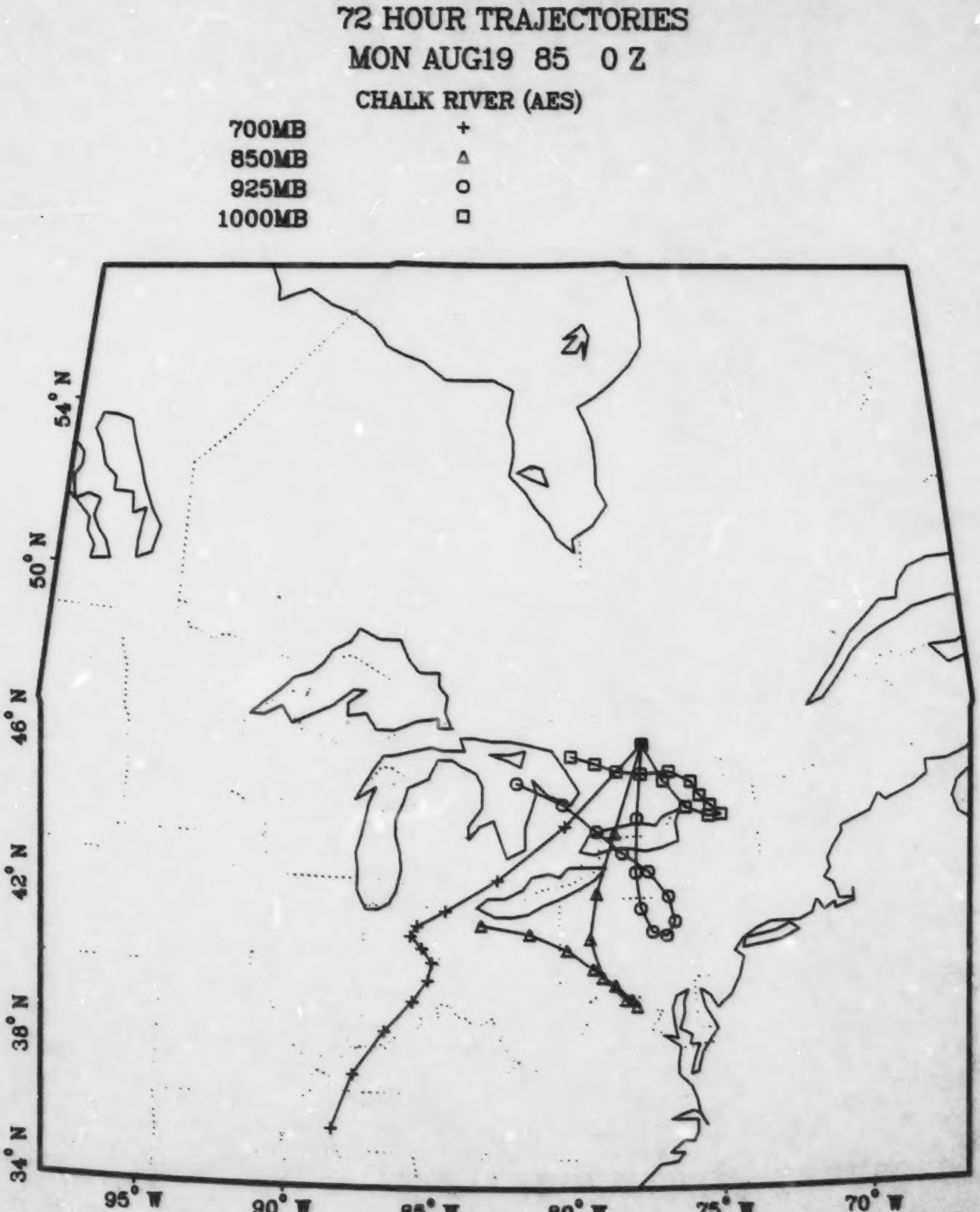

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.10



72 HOUR TRAJECTORIES
MON AUG19 85 0 Z
CHALK RIVER (AES)

700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.11

72 HOUR TRAJECTORIES
MON AUG19 85 6 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

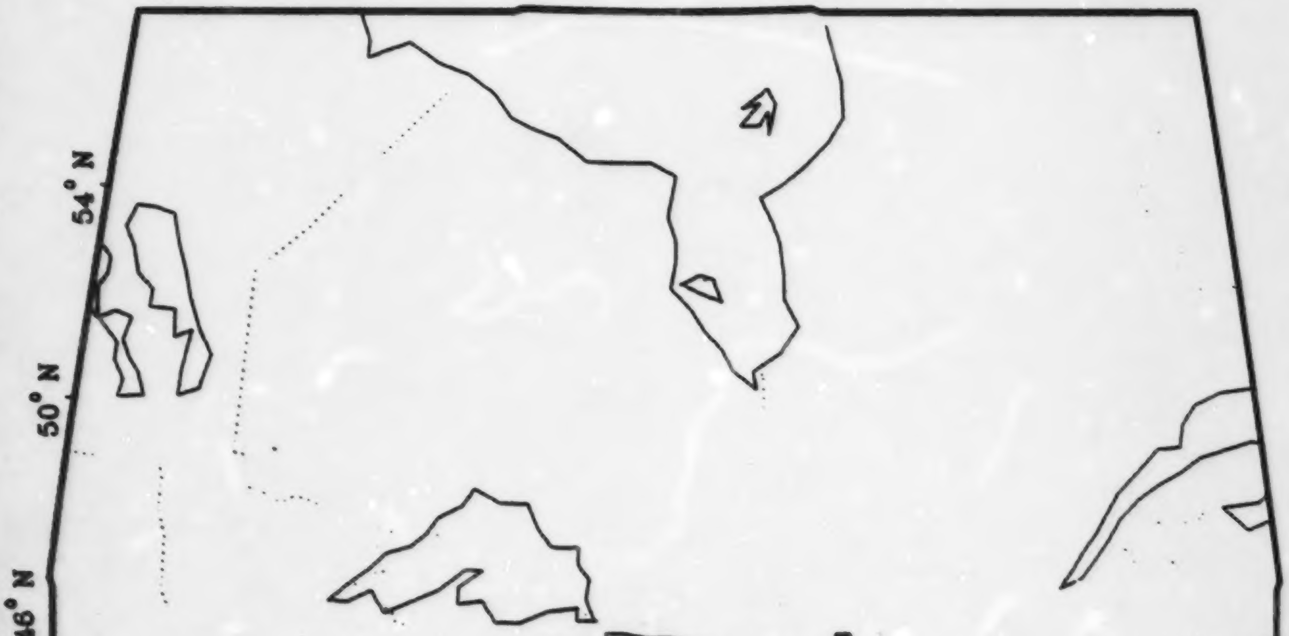

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.12

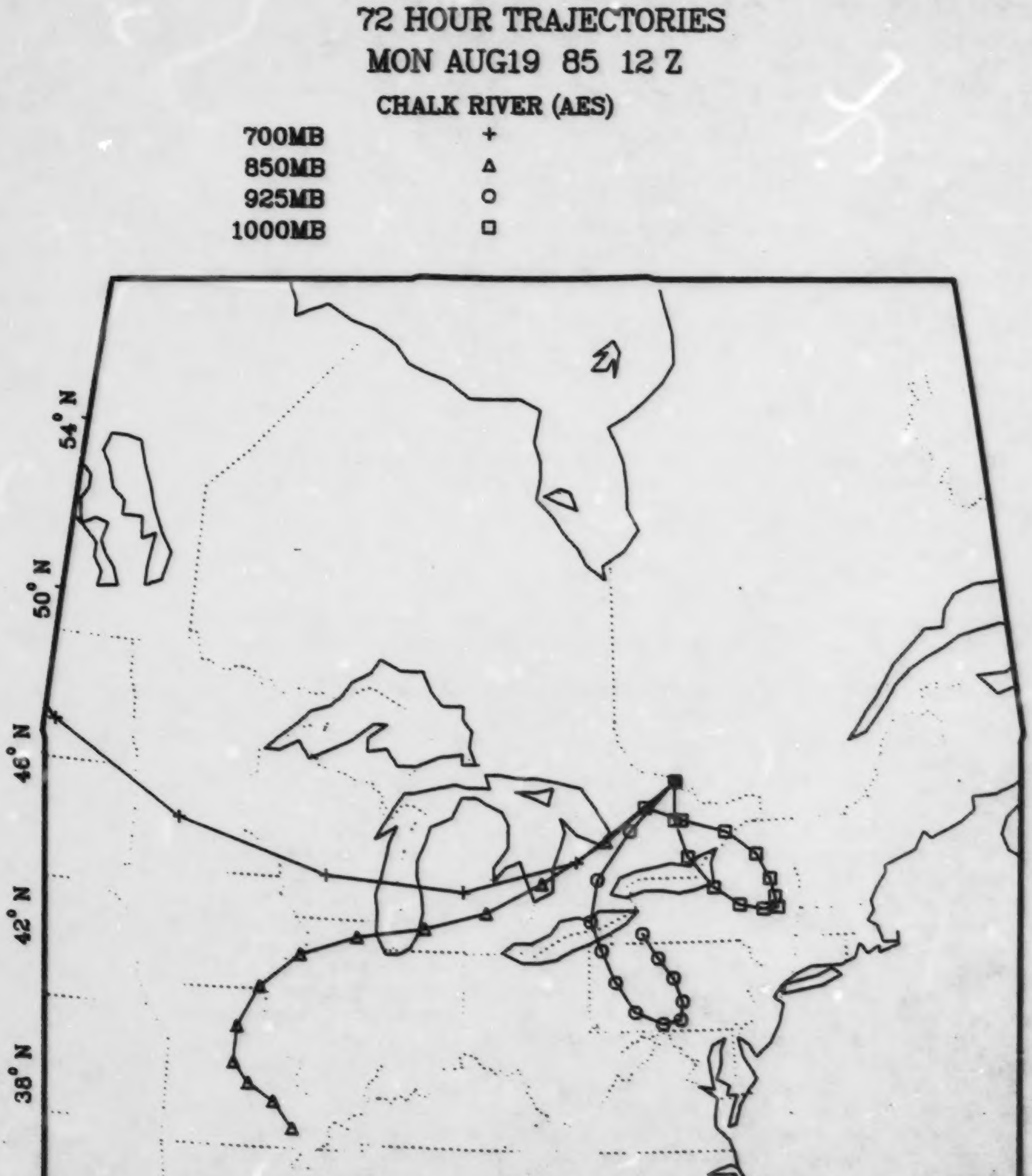

72 HOUR TRAJECTORIES
MON AUG19 85 12 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.16.13

1.17 August 23 -24, 1985, Longwoods(AES & MOE)

This episode ranked 1st (1/10) and 2nd (2/8) in the NO_3^- and $SO_4^=$ wet deposition events respectively at Longwoods (AES & MOE).

A low pressure centre of 1011 mb over Minnesota associated with the frontal system as shown in Fig. 1.17.1 was observed on August 23, at 12Z. This low moved in SE direction to lie over Lake Michigan on August 24, at 12Z, as shown in Fig. 1.16.2. The low had deepened slightly to 1010 mb and the warm front approached Longwoods. This gave rise to a continuous area of precipitation with Longwoods situated in it. Rain and rain showers of light(R_-, RW_-), moderate(R, RW) and heavy(R_+, RW_+) intensity were recorded at the nearest weather station London A, as shown in Fig. 1.17.3.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for August 23, at 12Z, 18Z and August 24, at 00Z, 06Z and 12Z are shown in Figures 1.17.4, 1.17.5, 1.17.6, 1.17.7 and 1.17.8 respectively.

Air trajectories for 1000 mb level did not pass over any highest emission areas of SO_2 and NO_x; however SO_2 from the high emission Sarnia area could have been transported(see Figs. 1.17.4-8). Pollution transport at this level is likely to be of minor importance.

Air trajectories for 925 mb level show that SO_2 from the highest emission area in Ohio could have been transported for a few hours as shown in Fig. 1.17.8. Transport of SO_2 & NO_x from their high emission areas in Ohio was probable (Figs.1.17.7&8).

Air parcels arriving at 850 mb level could have carried SO_2 from its highest and NO_x from its high emission Detroit area as exhibited in Figs. 1.17.6-8.

Air trajectories for 700 mb level show that SO_2 and NO_x from the highest emission Chicago area(Figs. 1.17.7&8) and SO_2 from the other area in Illinois could have been transported during this episode.

For this episode, air trajectories for 825 mb level were also available and it was found that air parcels could have carried SO_2 and NO_x from their highest emission Chicago area on August 24 for several hours as shown in the trajectories for 06Z and 12Z illustrated in Figs 1.17.9 &10. Transport of SO_2 from its highest and NO_x from its high emission Detroit area was also likely as shown in the figures.

Summarizing, a warm front approaching Longwoods gave rise to rain and rain showers of light, moderate and heavy intensity for some hours. It seems that low level transport of pollutant was of minor importance in comparison to the transport at high level. This is interpreted due to transport at 925 mb level from a highest emission source only for a few hours. High level (825 mb & 700 mb) transport of SO_2 and NO_x from the Chicago area, and of SO_2 from Detroit, Michigan, and other area in Illinois appear to be mainly responsible for this episode ranking first in NO_3^- and second in $SO_4^=$ wet deposition at both Longwoods AES and MOE stations. It should be noted that significant differences can occur even in pollution transport at levels varying by only 25 mb. This is illustrated as the trajectories for the 850 mb level did not pass over highest NO_x emission Chicago area but for the 825 mb level crossed over it.

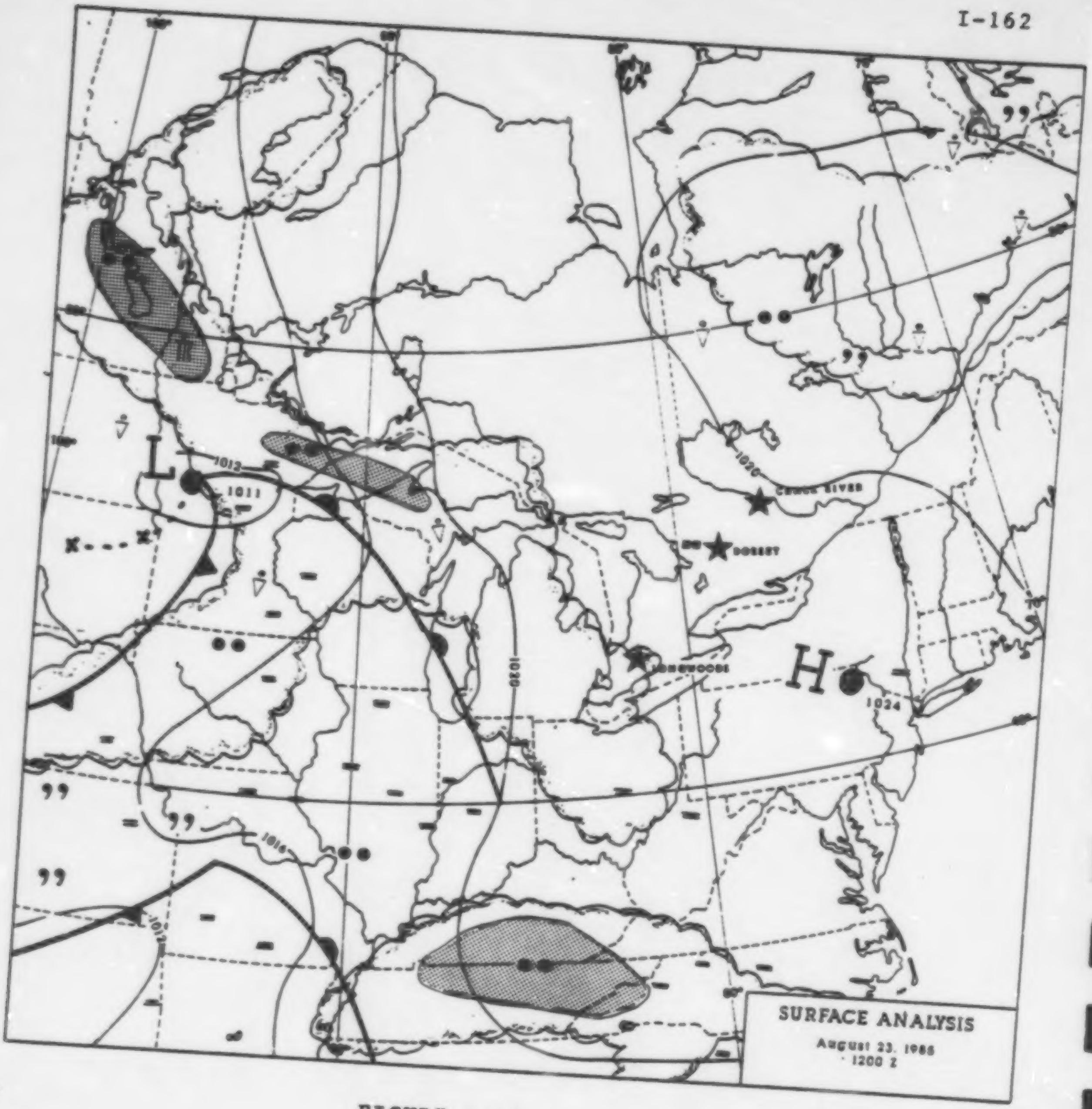

L
1012
1011
H
1024
1020
1016
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
August 23, 1986
1200 Z

FIGURE 1.17.1

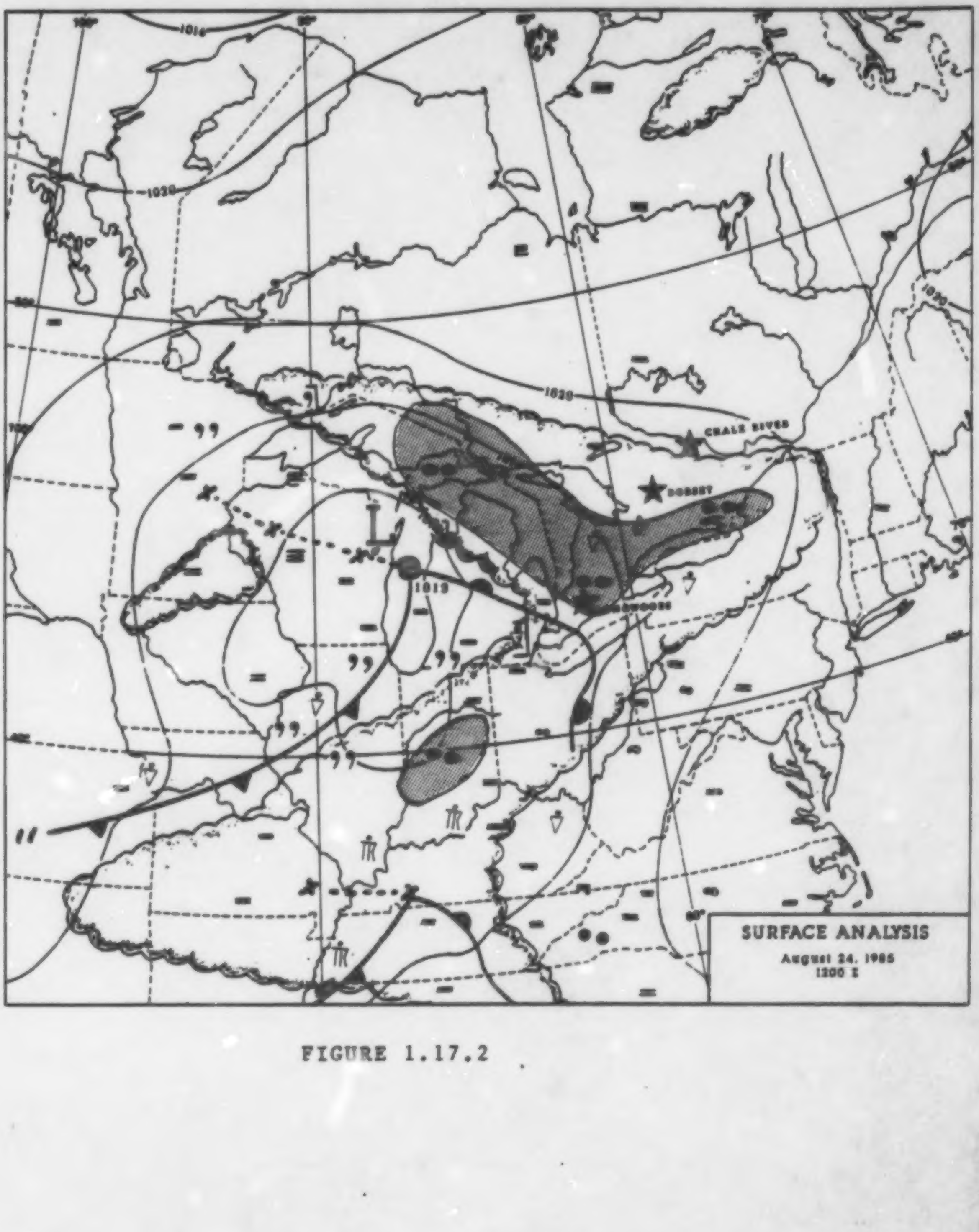
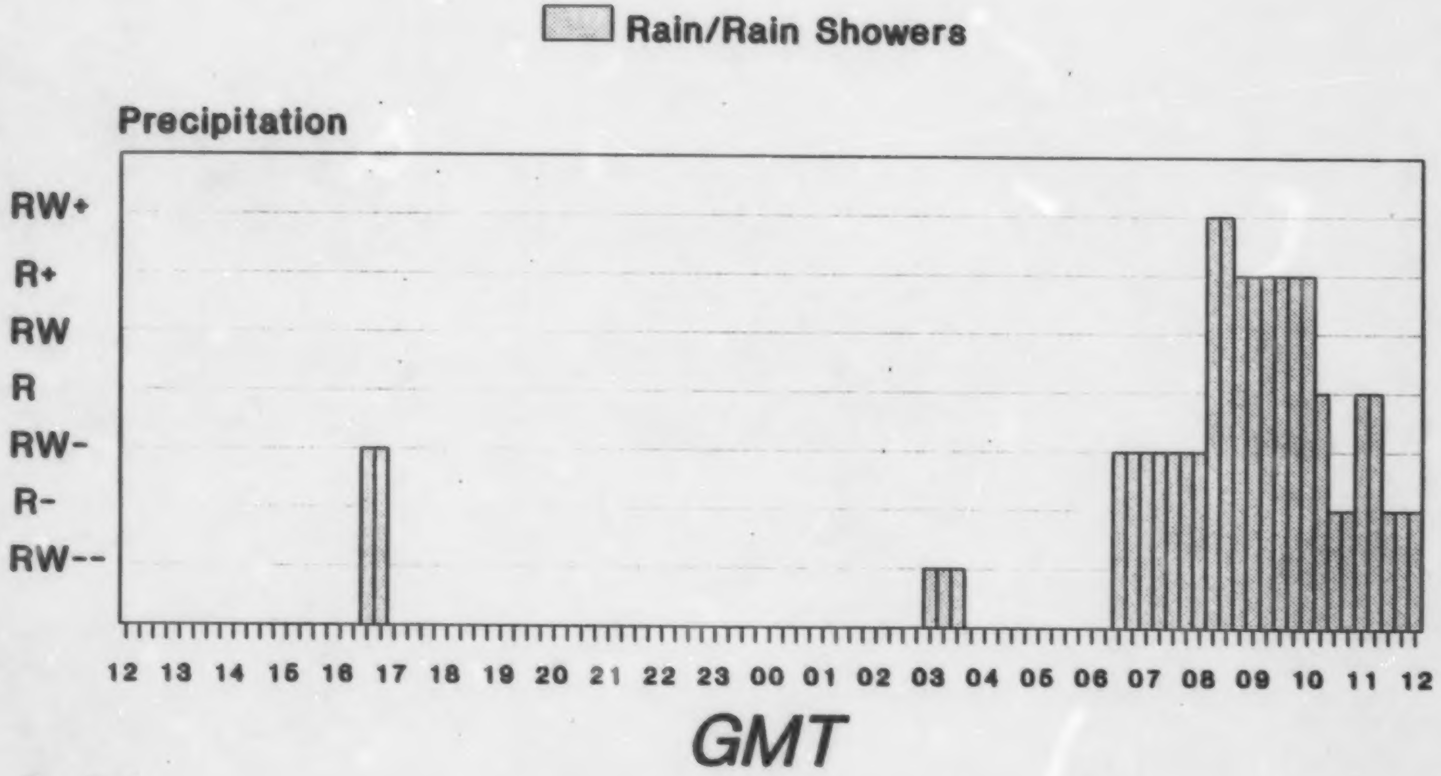

SURFACE ANALYSIS
August 24, 1985
1200 Z
CHALK RIVER
DORSET
1020
1016
1013

FIGURE 1.17.2

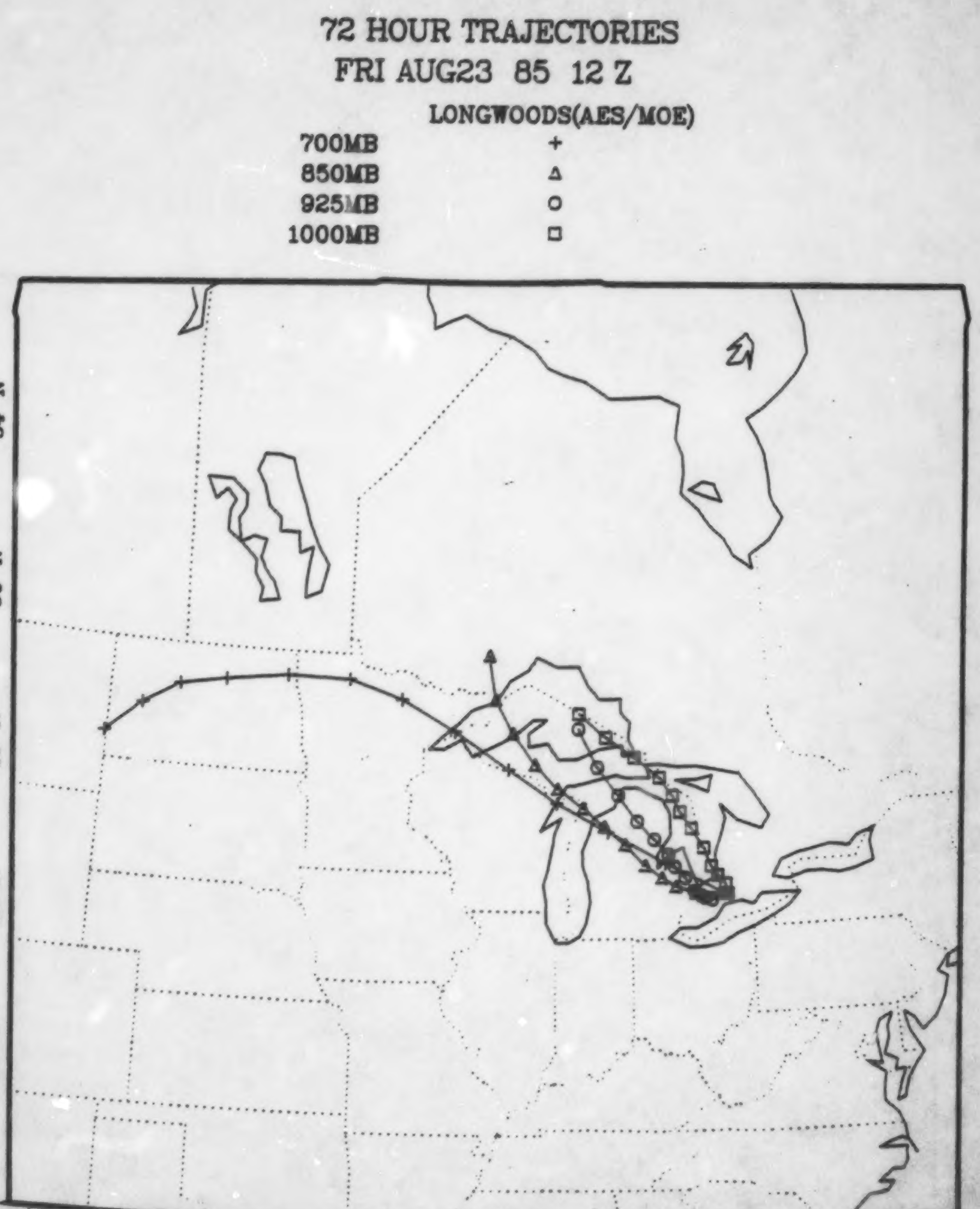
London A

Aug. 23-24, 1985



R - Rain
RW - Rain Showers

FIGURE 1.17.3



72 HOUR TRAJECTORIES
FRI AUG23 85 12 Z

LONGWOODS(AES/MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.17.4

72 HOUR TRAJECTORIES
FRI AUG23 85 18 Z

	LONGWOODS(AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

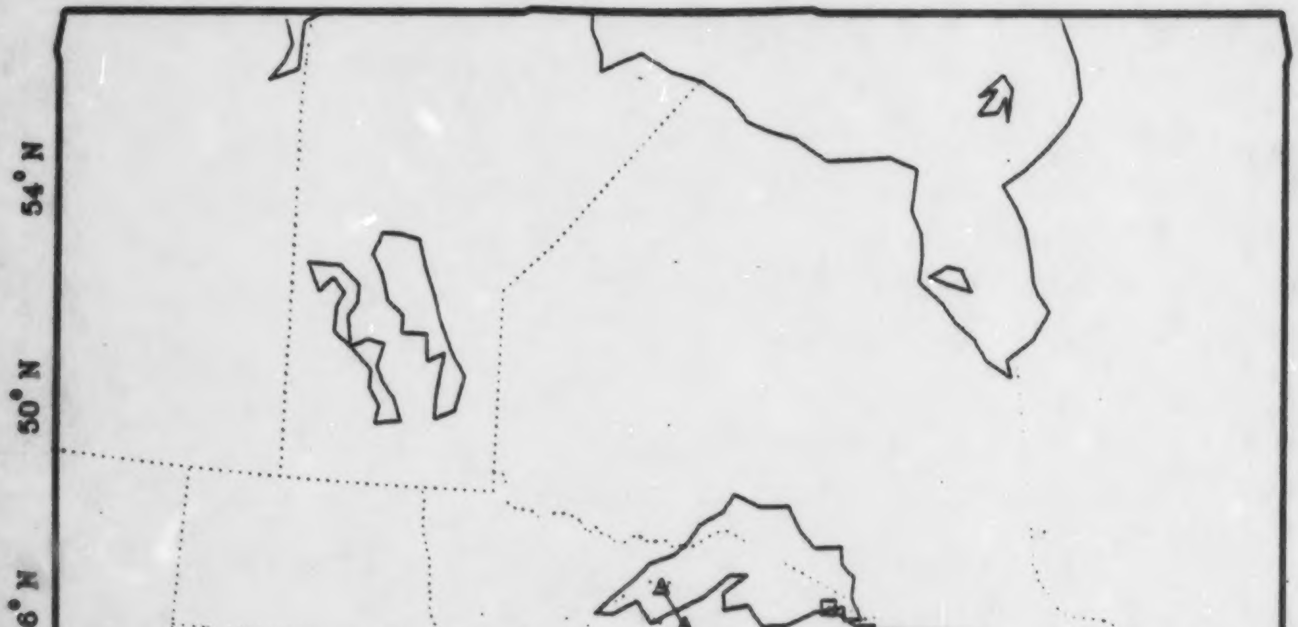

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

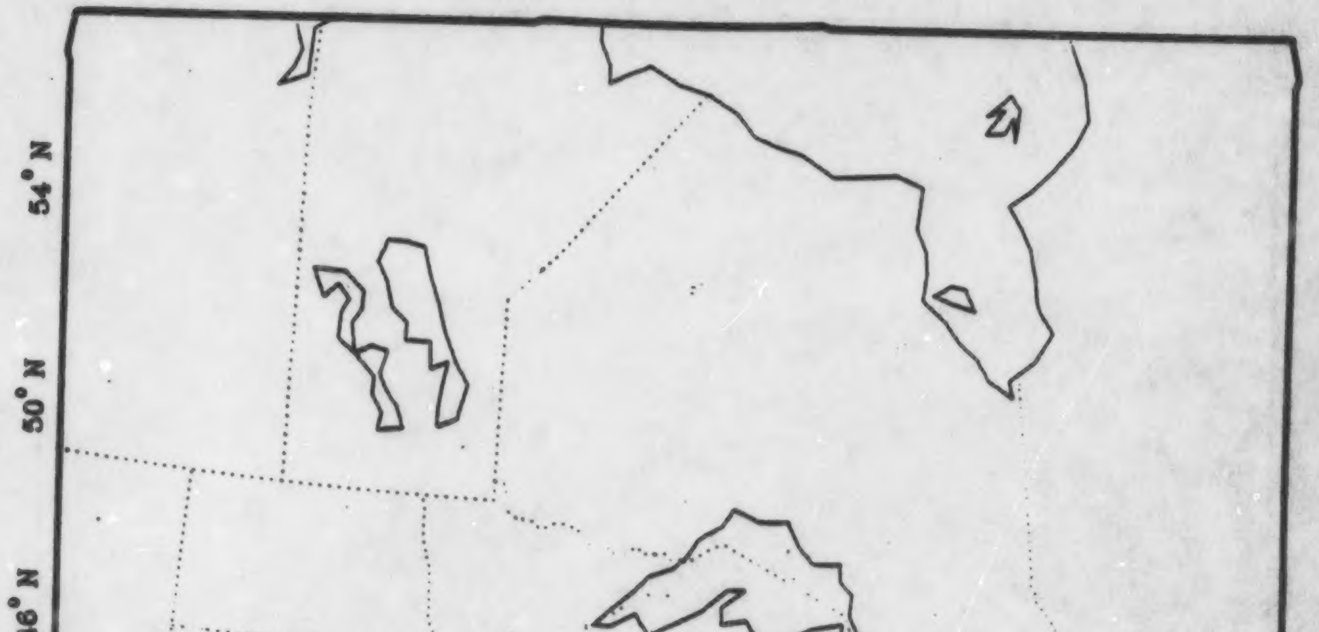
FIGURE 1.17.5

72 HOUR TRAJECTORIES

SAT AUG24 85 0 Z

LONGWOODS(AES/MOE)

700MB	+
850MB	Δ
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.17.6

72 HOUR TRAJECTORIES
SAT AUG24 85 6 Z

	LONGWOODS(AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

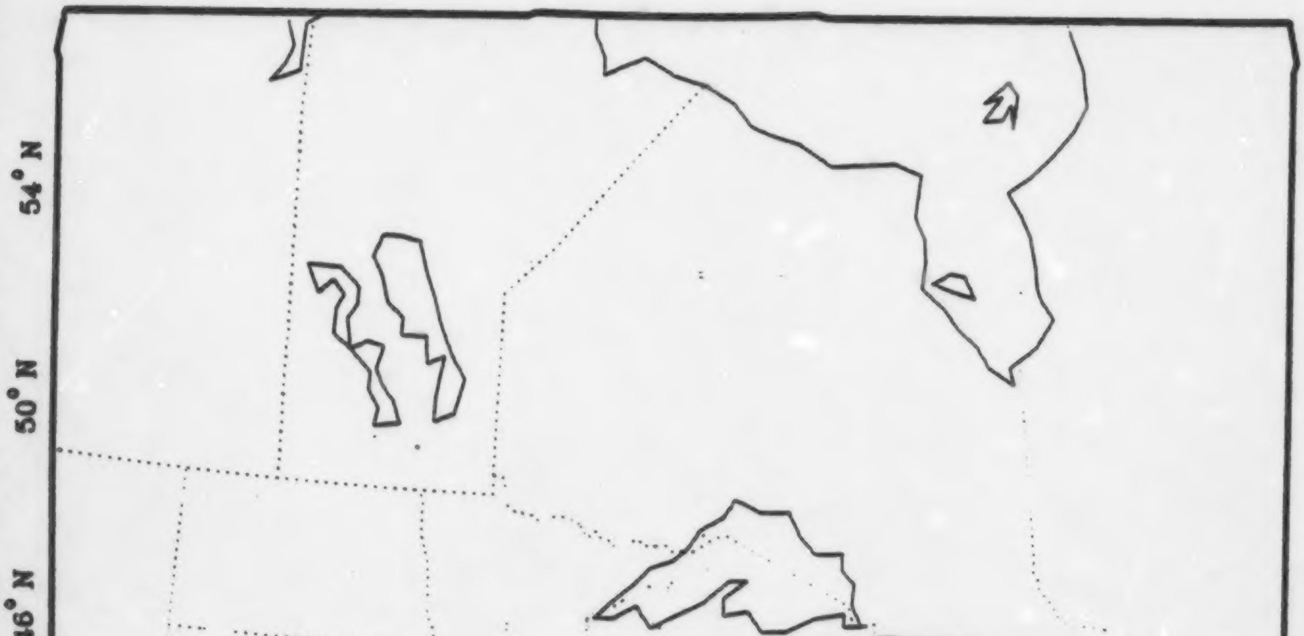

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.17.7

72 HOUR TRAJECTORIES
SAT AUG24 85 12 Z

LONGWOODS(AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

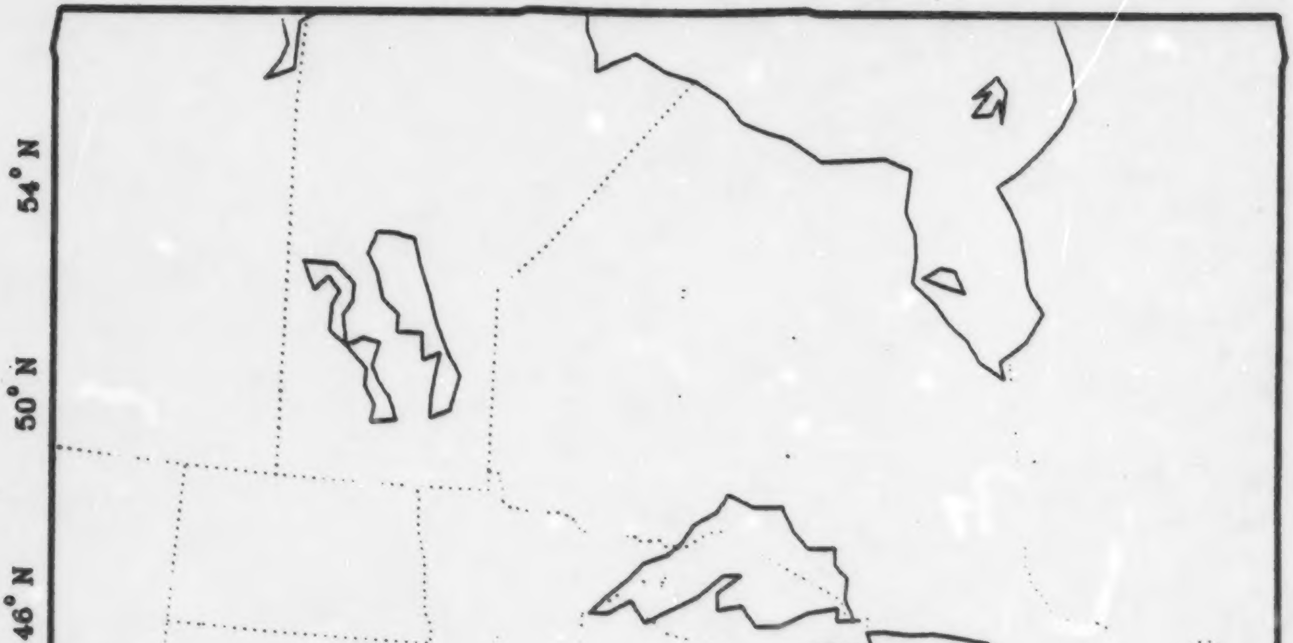

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.17.8

72 HOUR TRAJECTORIES
SAT AUG24 85 6 Z

LONGWOODS (AES/MOE)

825MB △

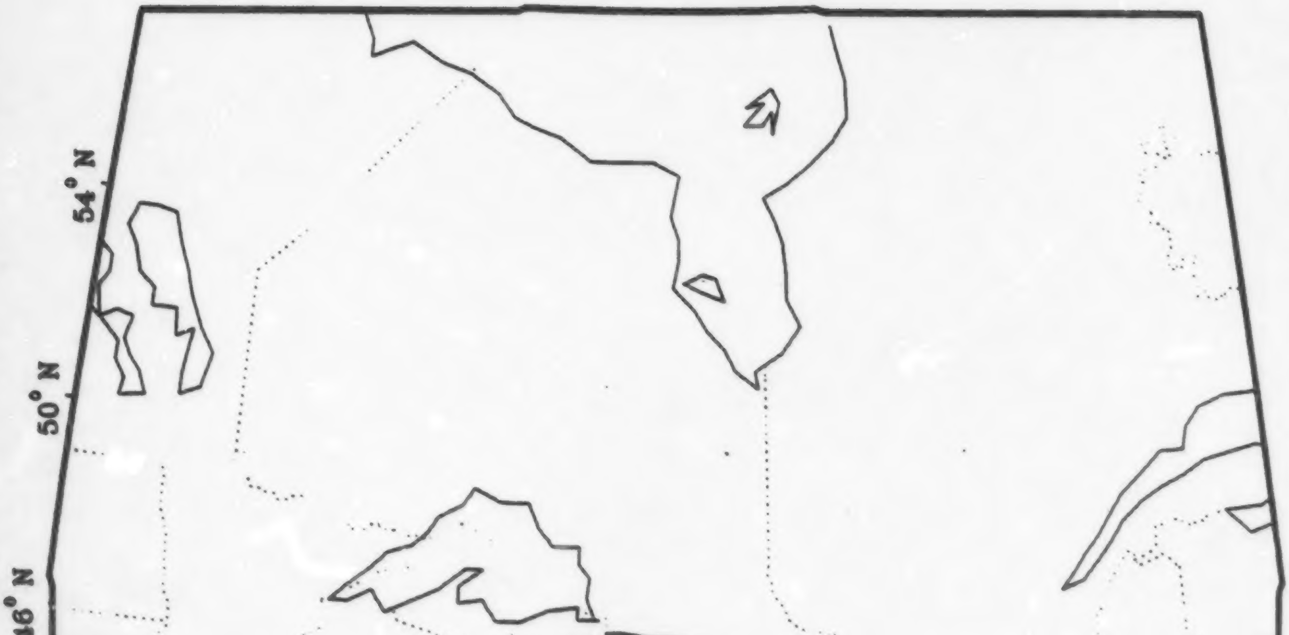

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.17.9

72 HOUR TRAJECTORIES
SAT AUG24 85 12 Z

LONGWOODS (AES/MOE)

825MB △

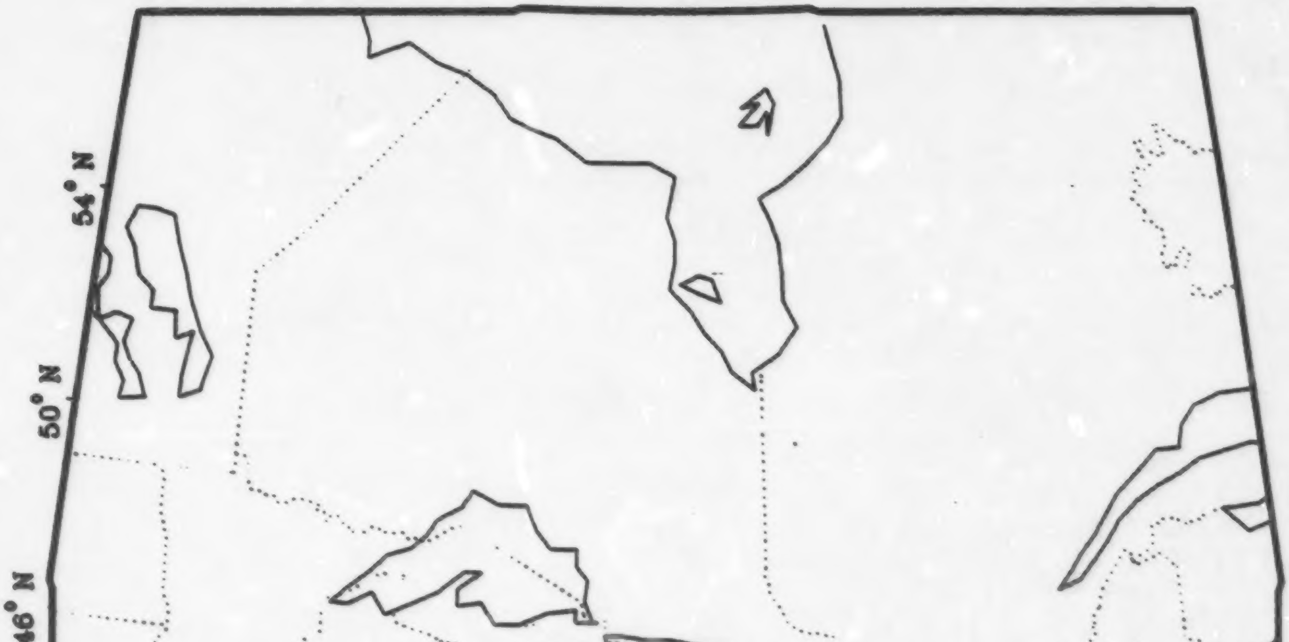

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.17.10

1.18 August 24-25,1985. Longwoods(AES & MOE)

This event ranked 7th (7/10) and 9th (9/10) for NO_3^- wet deposition events at Longwoods AES and MOE respectively.

On August 24, at 12Z, a warm front approached Longwoods, as shown in Fig. 1.18.1. During the next 24 hours, the warm front hovered around the station and on August 25, at 12Z, it lay just south of the station as shown in Fig. 1.18.2. The lingering of the warm front yielded rain of very light(R_{--}), light(R_-), moderate(R) and heavy(R_+) intensity as shown in Fig. 1.18.3. Very light(RW_{--}) and light(RW_-) rain showers also fell as shown in the figure.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for August 24, at 12Z, 18Z and August 25, at 00Z, 06Z and 12Z are shown in Figures 1.18.4, 1.18.5, 1.18.6, 1.18.7 and 1.18.8 respectively.

Air parcels arriving at 1000 mb level did not pass over any highest NO_x emission area but could have carried NO_x on a sustained basis from the high emission areas in Pennsylvania throughout the episode starting from April 24, 18Z, as shown in Figs. 1.18.5-8.

Air trajectories for 925 mb level show that NO_x from high emission areas in Ohio, West Virginia and Pennsylvania could have been transported (see Figs. 1.18.4-8).

Air parcels arriving at 850 mb level show that NO_x from high emission Detroit area (Figs. 1.18.4-5) could have been transported.

Air trajectories for the 825 mb level were also available for this episode and it was found that, as shown in Fig. 1.18.9, transport of NO_x from the highest emission Chicago area could have taken place on August 24, at 12Z.

Air trajectories for 700 mb level show that transport of NO_x from its highest emission chicago area (Fig. 1.18.4) and high emission Detroit area (Fig. 1.18.6-8) were likely during this episode.

In summary, a warm front hovered around the station throughout the episode and yielded rain showers/rain of very light and light intensity and also rain of moderate & heavy intensity. Low level transport (1000 mb & 925 mb) of NO_x from high emission area in Pennsylvania, West Virginia and Ohio and high level transport (850, 825 mb and 700 mb) of NO_x from the highest emission Chicago and high emission Detroit area were likely. It should be noted that the transport of NO_x from the highest emission Chicago area occurred at levels higher than 850 mb.

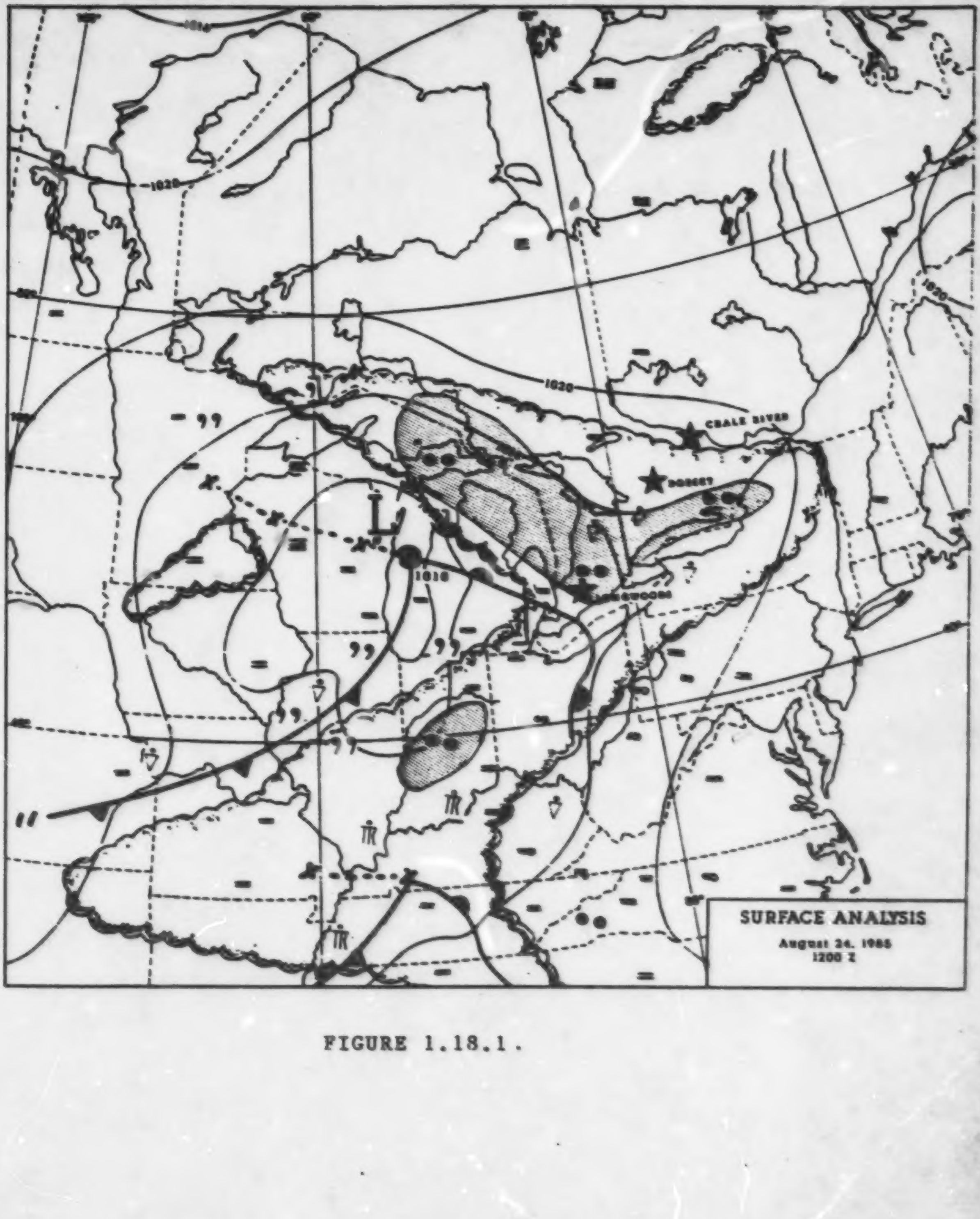

1020
1020
1020
1016
L
CHALK RIVER
DORSET
SURFACE ANALYSIS
August 24, 1985
1200 Z

FIGURE 1.18.1.

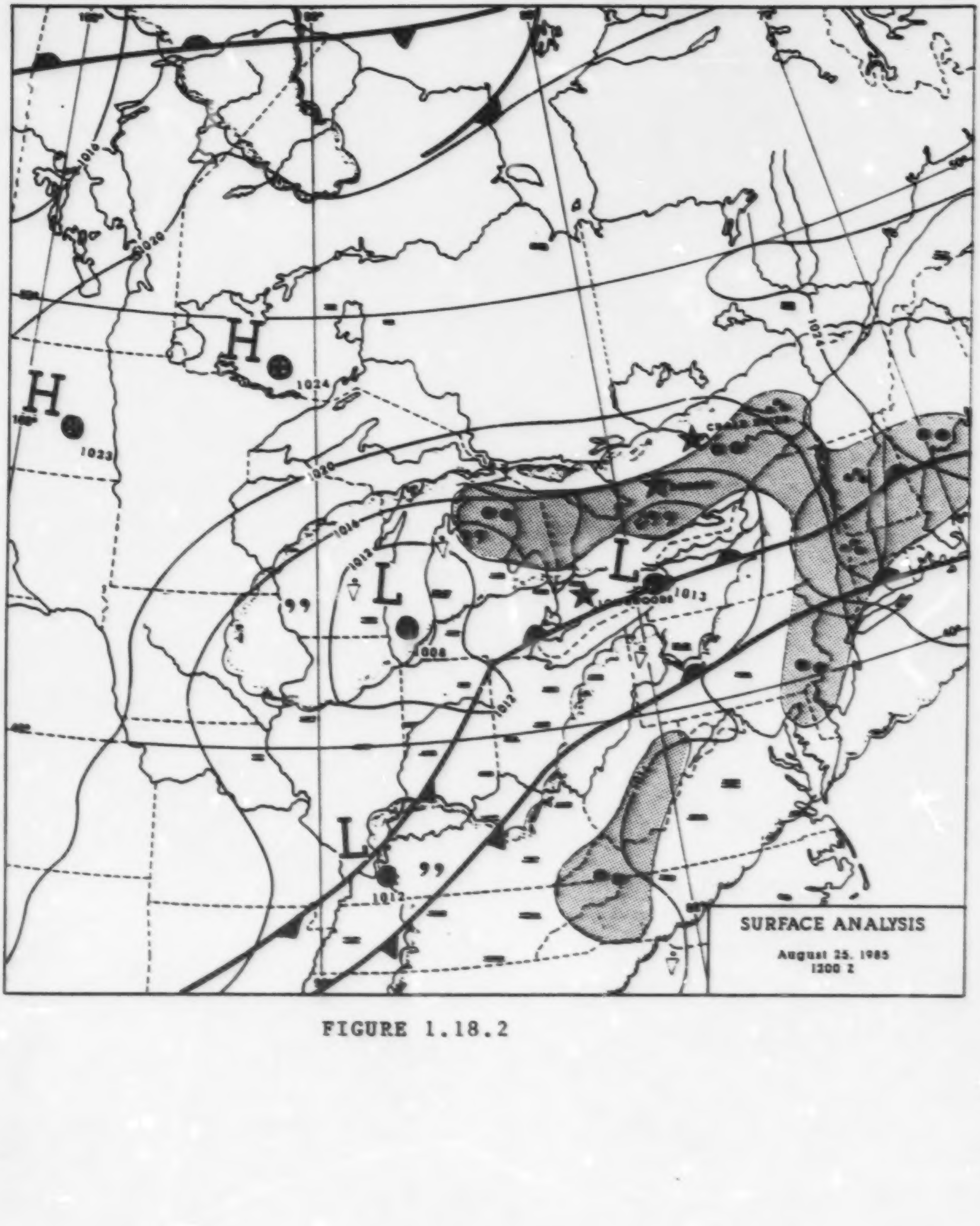
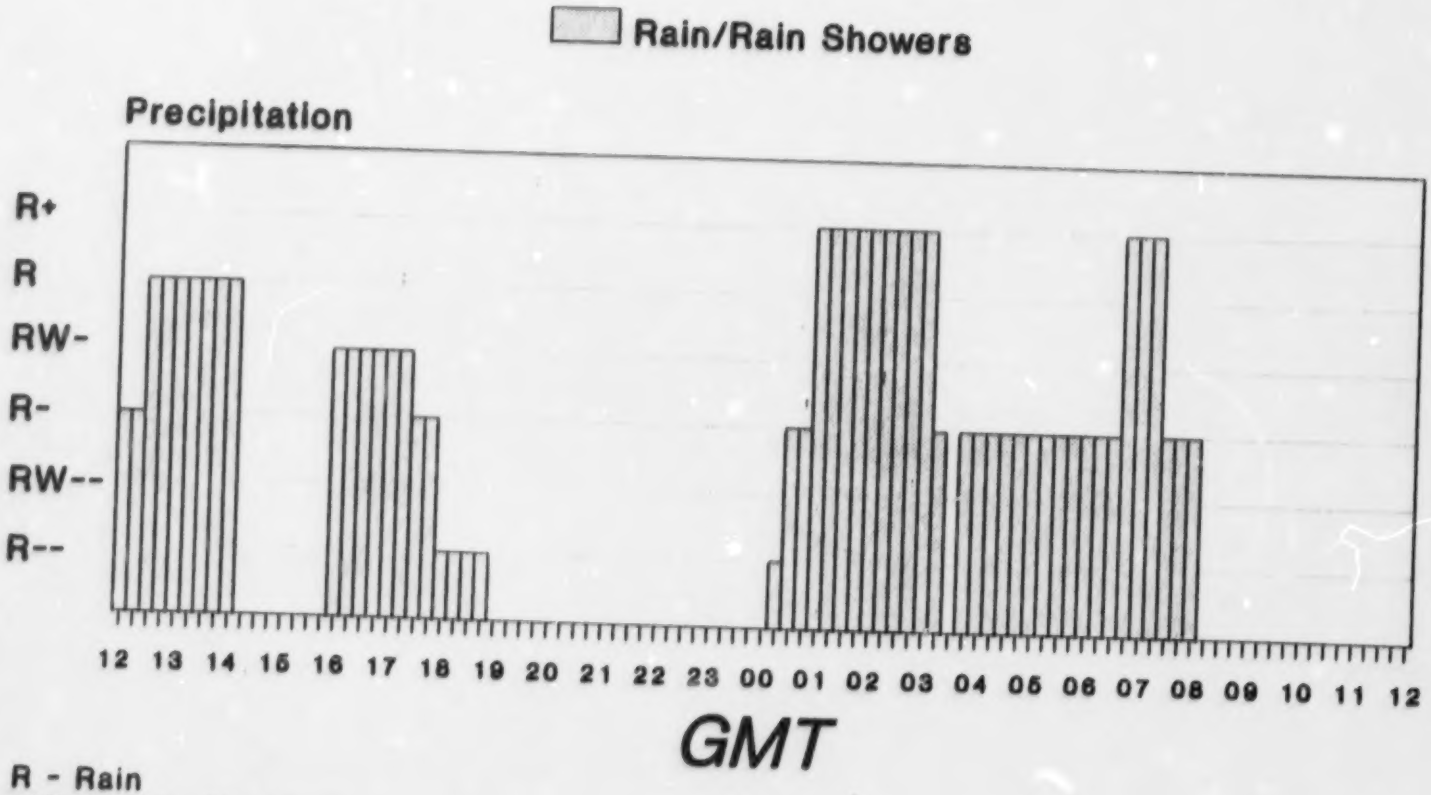

SURFACE ANALYSIS
August 25, 1985
1200 Z
H
H
L
L
L
1024
1023
1020
1016
1012
1008
1013
1012

FIGURE 1.18.2

London A

Aug. 24-25, 1985



R - Rain
RW - Rain Showers

FIGURE 1.18.3

72 HOUR TRAJECTORIES
SAT AUG24 85 12 Z

	LONGWOODS(AES/MOE)
700MB	+
850MB	Δ
925MB	○
1000MB	□

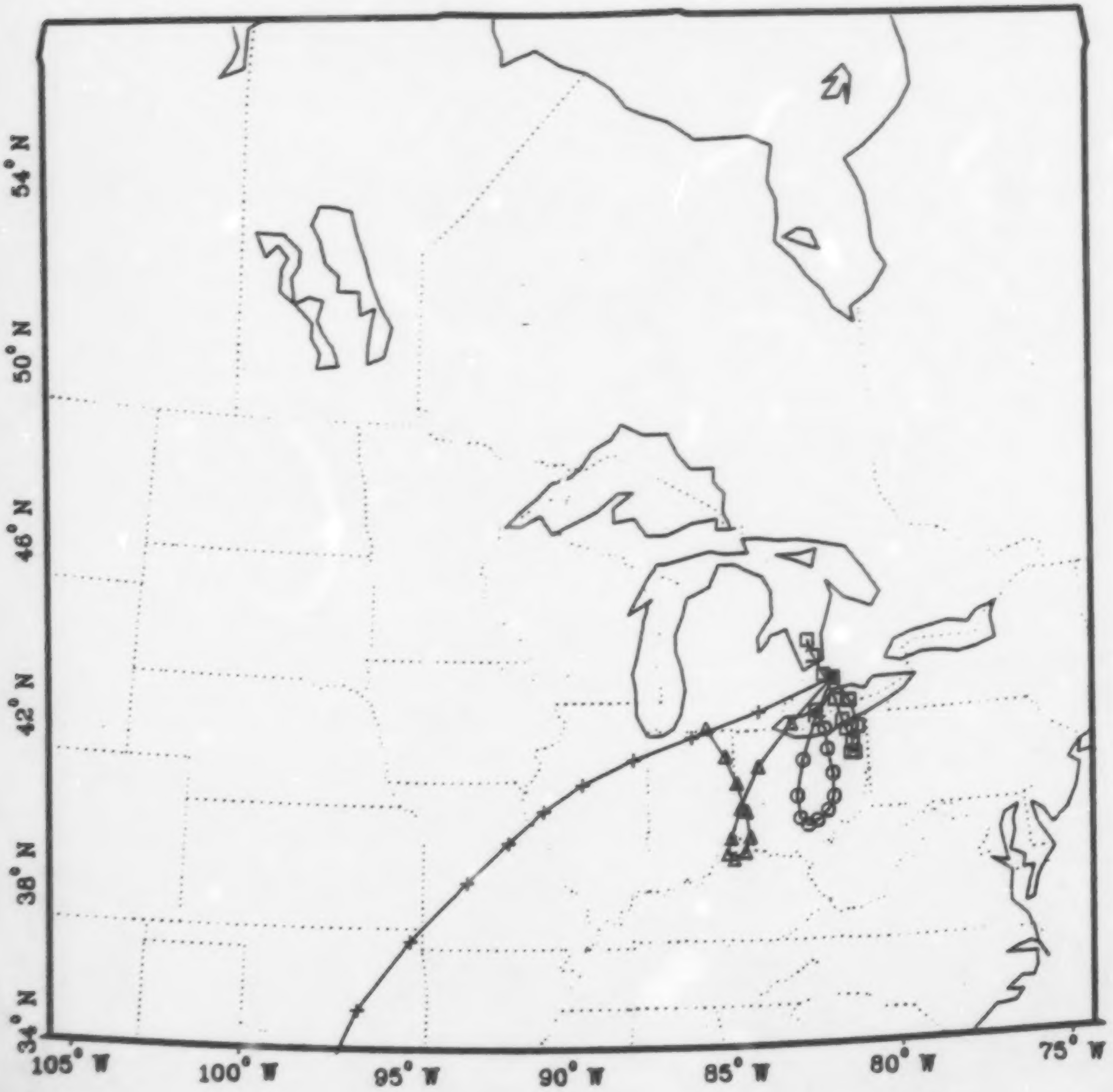

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.18.4

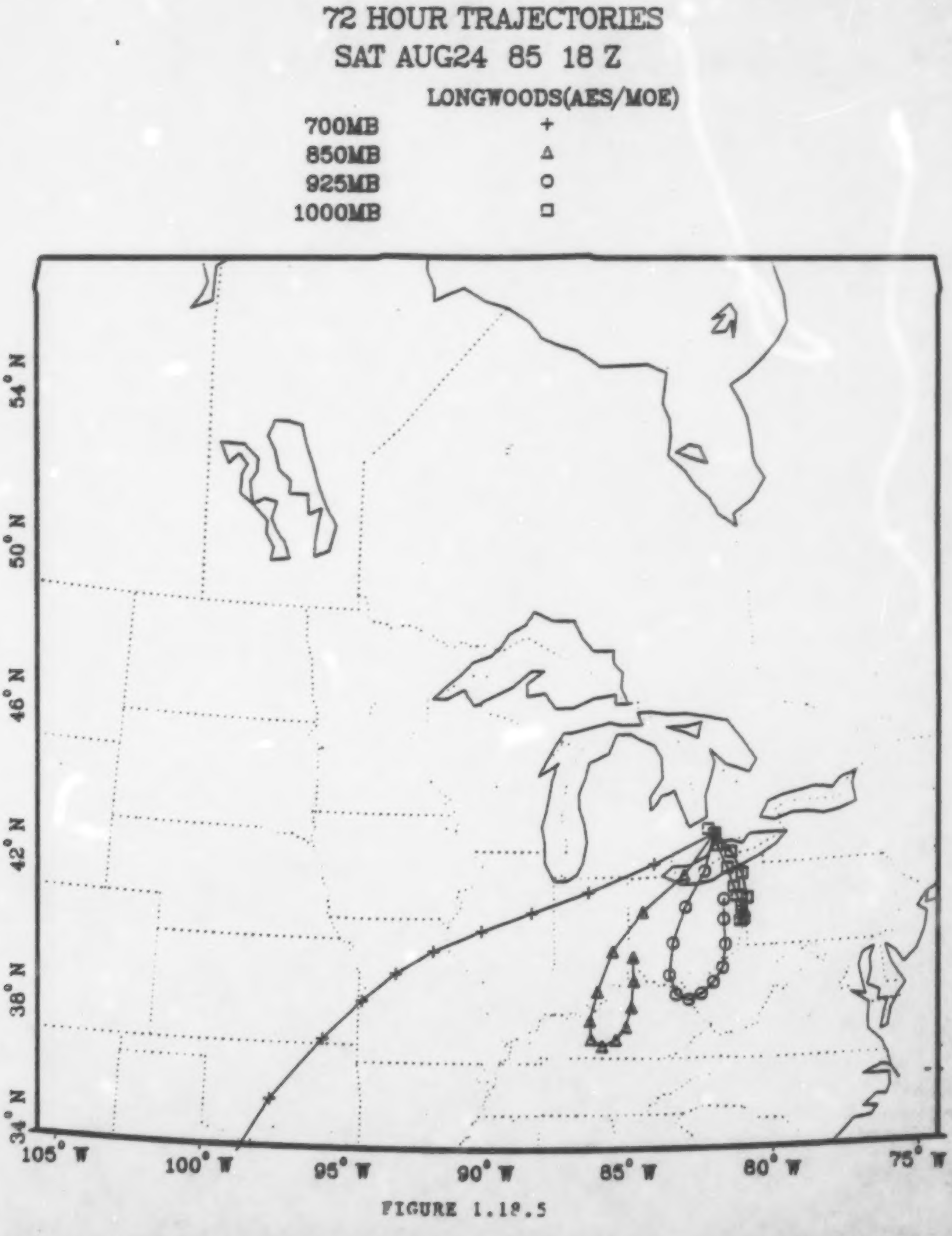

72 HOUR TRAJECTORIES
SAT AUG24 85 18 Z
LONGWOODS(AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.18.5

72 HOUR TRAJECTORIES
SUN AUG25 85 0 Z

	LONGWOODS(AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

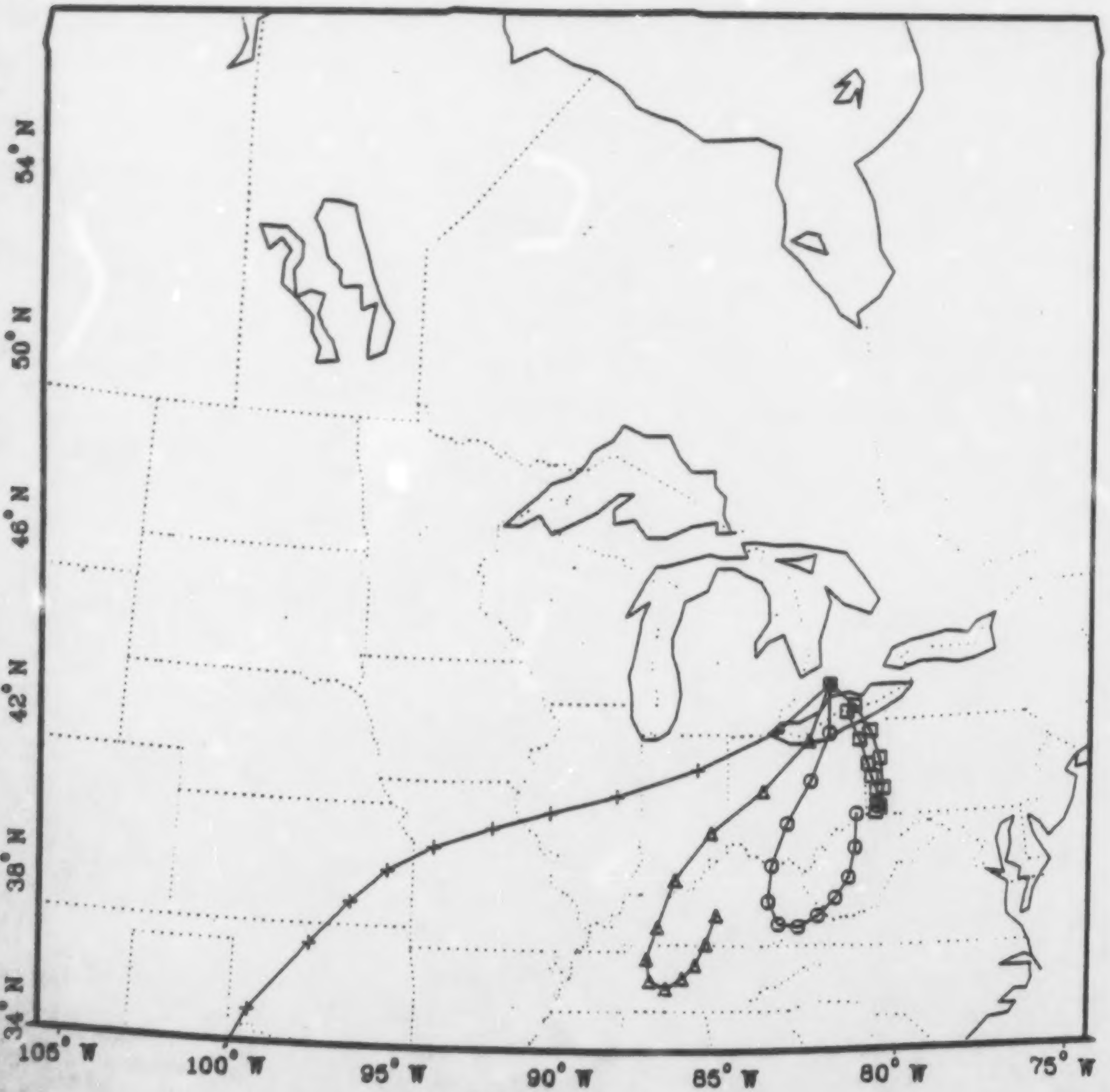
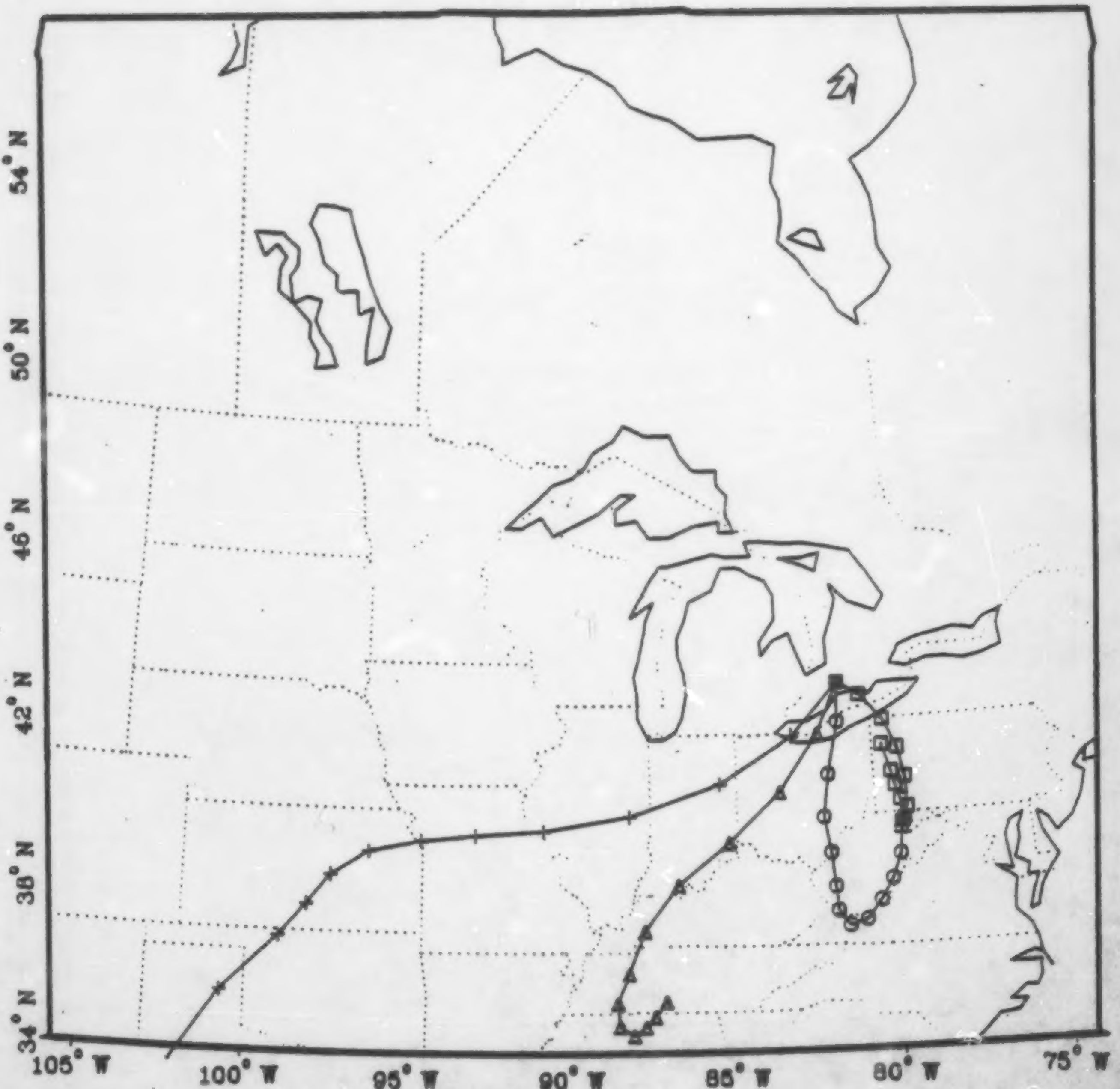

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.18.6

72 HOUR TRAJECTORIES
SUN AUG25 85 6 Z

LONGWOODS(AES/MOE)

700MB +
850MB Δ
925MB ○
1000MB □



54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.18.7

72 HOUR TRAJECTORIES
SUN AUG25 85 12 Z

	LONGWOODS(AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

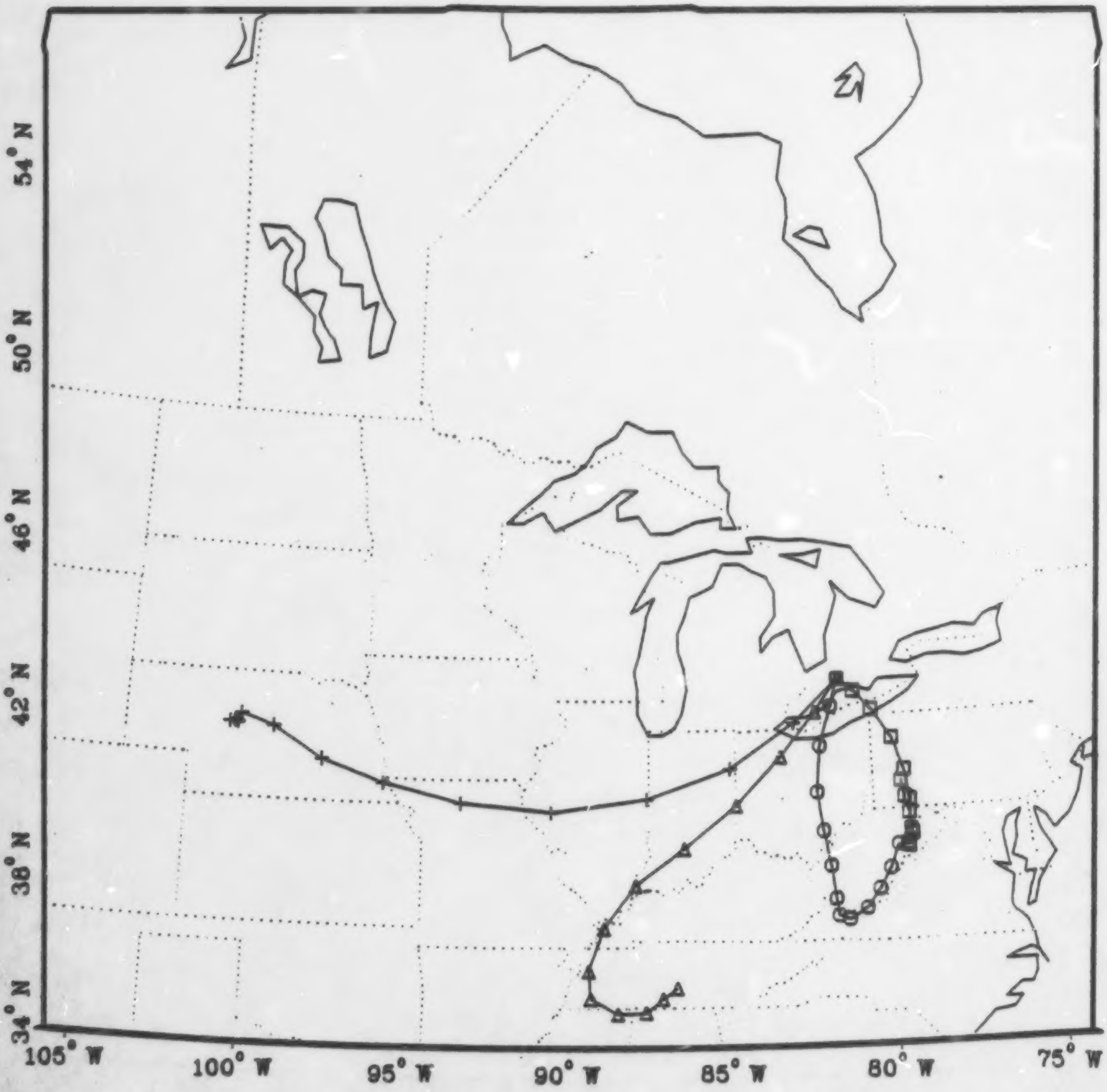

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.18.8

72 HOUR TRAJECTORIES
SAT AUG24 85 12 Z

LONGWOODS (AES/MOE)

825MB Δ

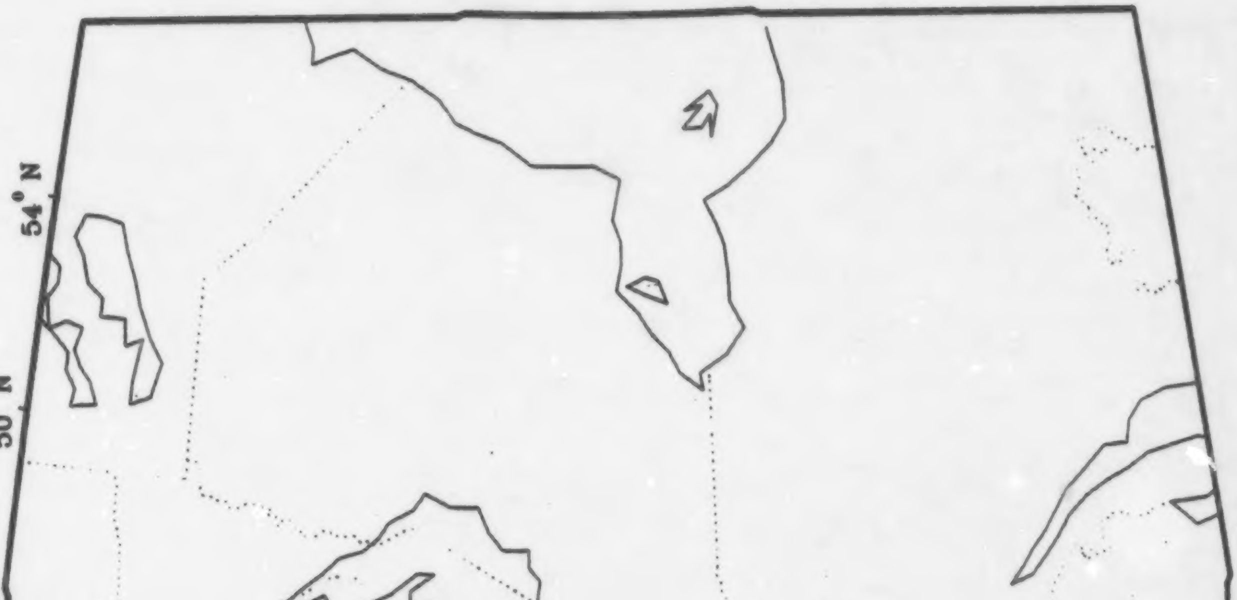

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.18.9

1.19 August 26-27, 1985. Longwoods(AES/MOE) & Chalk River

This event was recorded at two locations. For Longwoods(AES) station, it ranked 6th (6/8) for $SO_4^=$ and 9th (9/10) for NO_3^-. The rankings for Longwoods (MOE) were 5th (5/8) and 9th (9/10) for $SO_4^=$ and NO_3^- respectively. For Chalk River, it only ranked 4th (4/5) for $SO_4^=$. Separate narratives for Longwoods and Chalk River are as follows:

Longwoods

A low pressure centre, 1005 mb, associated with a frontal system was located near Windsor on August 26 at 12Z, as shown in Fig. 1.19.1. It moved in a NE direction to lie over the station in the next few hours and by August 27, at 12Z, it was situated over southern Quebec as illustrated in Fig. 1.19.2. Although the fronts appear to have remained south of the station, their close proximity and the passage of the low pressure centre yielded showery weather as shown in Fig. 1.19.3A. Lightning, thunder and heavy rain showers were observed as the system passed over London, the nearest weather station. As exhibited in this figure, rain and thundershowers of different intensity were recorded at London with a brief occurrence of very light drizzle near the end of the episode.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for August 26, at 12Z, 18Z and August 27, at 00Z, 06Z and 12Z are shown in Figures 1.19.4, 1.19.5, 1.19.6, 1.19.7 and 1.19.8 respectively.

Air trajectories for 1000 mb level did not pass over any highest NO_x emission area(see Fig. 1.19.4-8) but passed over the highest SO_2 & high NO_x emission areas near Pittsburg, Pennsylvania as shown in Figs. 1.19.7-8 and could have transported SO_2 & NO_x from these regions.

Air parcels arriving at 925 mb level did not pass over any highest SO_2 & NO_x emission areas but travelled over high emission areas in Ohio and could have transported pollution from these areas.

Air trajectories for 850 mb level show that SO_2 from its highest emission Detroit, Michigan (Figs 1.19.6&8) area and other area in Illinois (Fig. 1.19.7) could have been transported to Longwoods. Also, NO_x from its high emission sources around Cleveland, Ohio(Fig. 1.19.4), Detroit, Michigan(Fig.1.19.6&8) and St. Louis, Missouri, area (Fig. 1.19.7) could have been transported.

Air parcels arriving at 700 mb level could have carried pollutants from SO_2 highest and NO_x high emission areas in Detroit, Michigan(Fig.1.19.6) and Illinois(Fig.1.19.7-8).

In summary a low pressure centre associated with warm and cold fronts passed over the station yielding showers and thundershowers. Lightning was observed as the system passed over. Low level transport (1000 mb) of SO_2 from the highest emission areas near Pittsburg, Pennsylvania, and high level (850mb&700mb) transport of SO_2 from highest emission areas near Detroit, Michigan and in Illinois were likely. No highest NO_x emission source regions were involved in transport but low and high level transport from a number of high emission areas was possible.

1.19 August 26-27, 1985 continued

Chalk River

The low pressure centre associated with a frontal system that passed over Longwoods earlier on August 26 passed over Chalk River on August 27 to lie over southern Quebec (see Figs. 1.19.1&2). Again, the fronts did not pass over the station. As this system gradually approached the station, mostly light showers were recorded at Petawawa as shown in Fig.1.19.3B. These changed to thundershowers of very light to moderate intensity and lightning and thunder were observed. Rainfall occurred for longer duration at Petawawa than at Longwoods.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for August 26, at 12Z, 18Z and August 27, at 00Z, 06Z and 12Z are shown in Figures 1.19.9, 1.19.10, 1.19.11, 1.19.12 and 1.19.13 respectively.

Air trajectories for 1000 mb level did not pass over any significant emission areas (see Figs.1.19.9-13) and therefore pollution transport at this level would be insignificant.

Air parcels arriving at 925 mb level did not come from any highest SO_2 emission area but passed over high emission areas near New York city - Philadelphia, Pennsylvania region, as shown in Figs.1.19.8-13, and could have transported SO_2. Although NO_x could have also been transported from these regions but is not considered since this episode did not rank among the top 25% for NO_x deposition.

Air trajectories for 850 mb level show, as exhibited in Figs. 1.19.8-12, that SO_2 from the highest emission areas in Pennsylvania-West Virginia-Ohio region could have been transported for most of the duration of this episode.

Air parcels arriving at 700 mb level could have transported SO_2 from the highest emission area in Illinois-Missouri (Figs. 1.19.8&9) and Detroit, Michigan area(Fig. 1.19.13).

Summarizing, a low pressure centre, associated with frontal system, passed over the station giving showers and thundershowers intermittently throughout the episode. Lightning and thunder were observed. High level transport(850 mb & 700 mb) of SO_2 from the highest emission areas in Pennsylvania, West Virginia, Ohio, Illinois and Detroit, Michigan appear to be more significant than that at low level during this episode since no highest emission sources are involved in the low level transport.

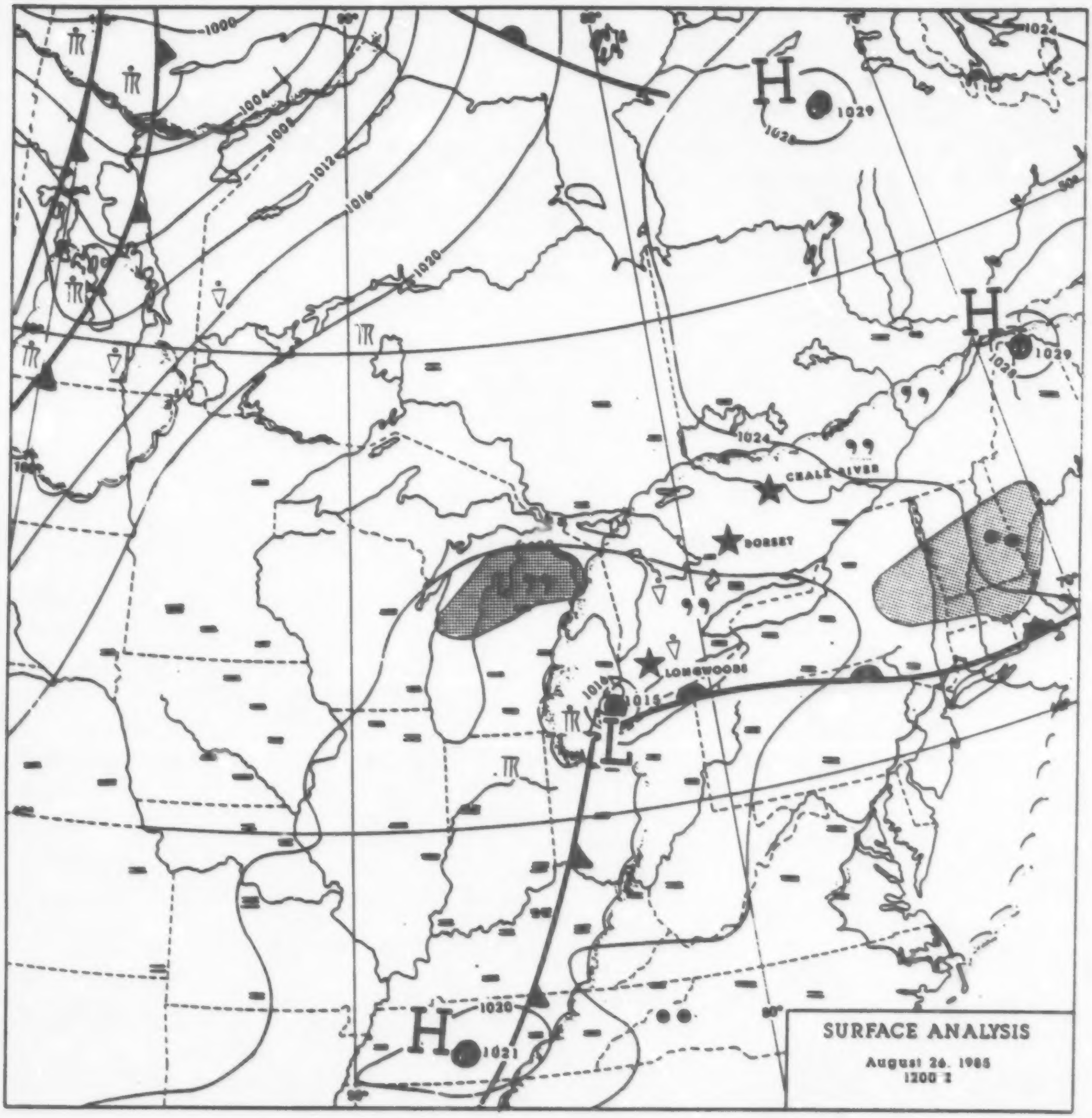

1000
1004
1008
1012
1016
1020
1024
1029
1028
1021
1020
1016
1015
H
H
H
L
CHALK RIVER
DORSET
LONGWOODS
90°
80°
70°
SURFACE ANALYSIS
August 26, 1985
1200 Z

FIGURE 1.19.1

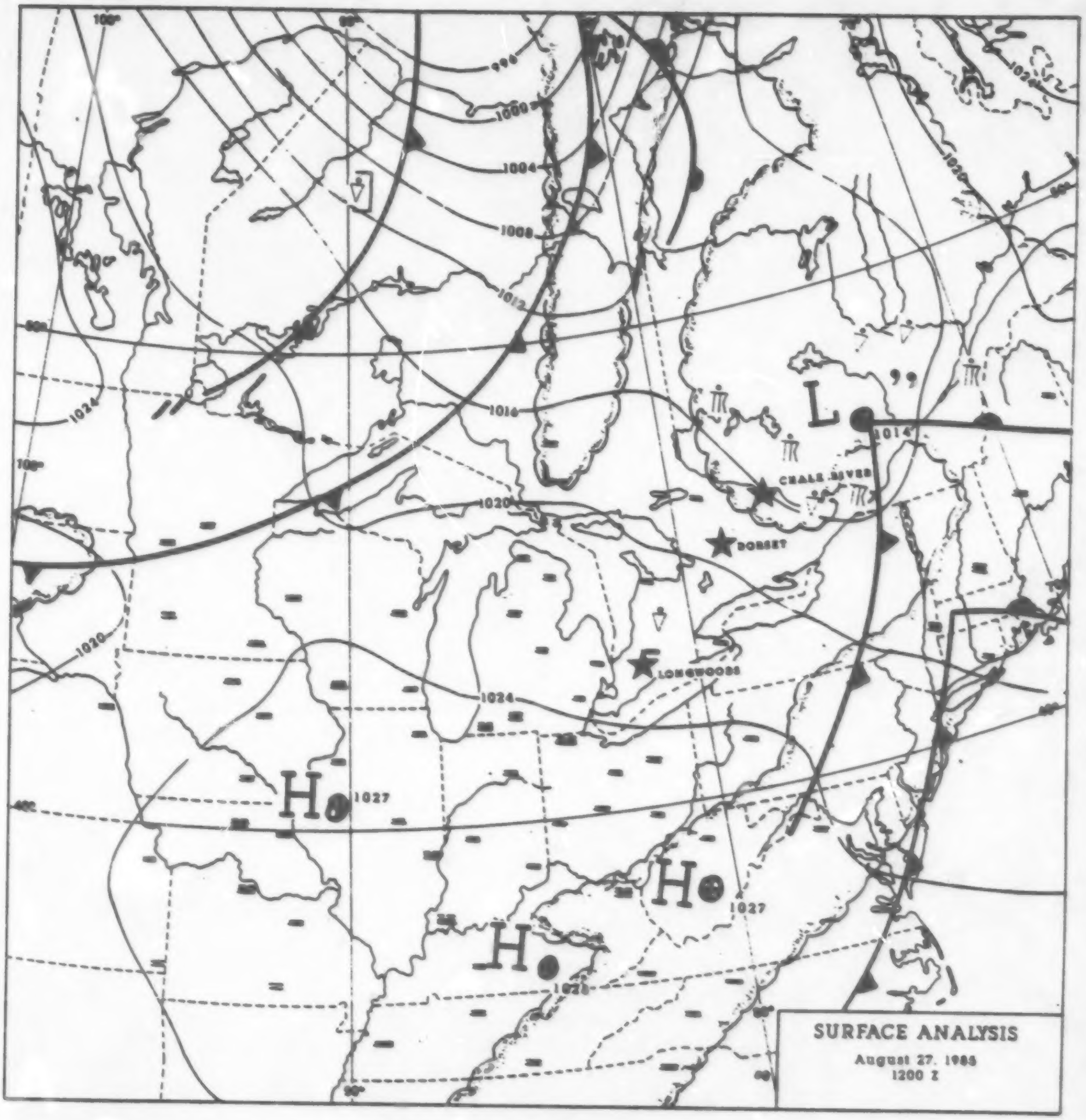
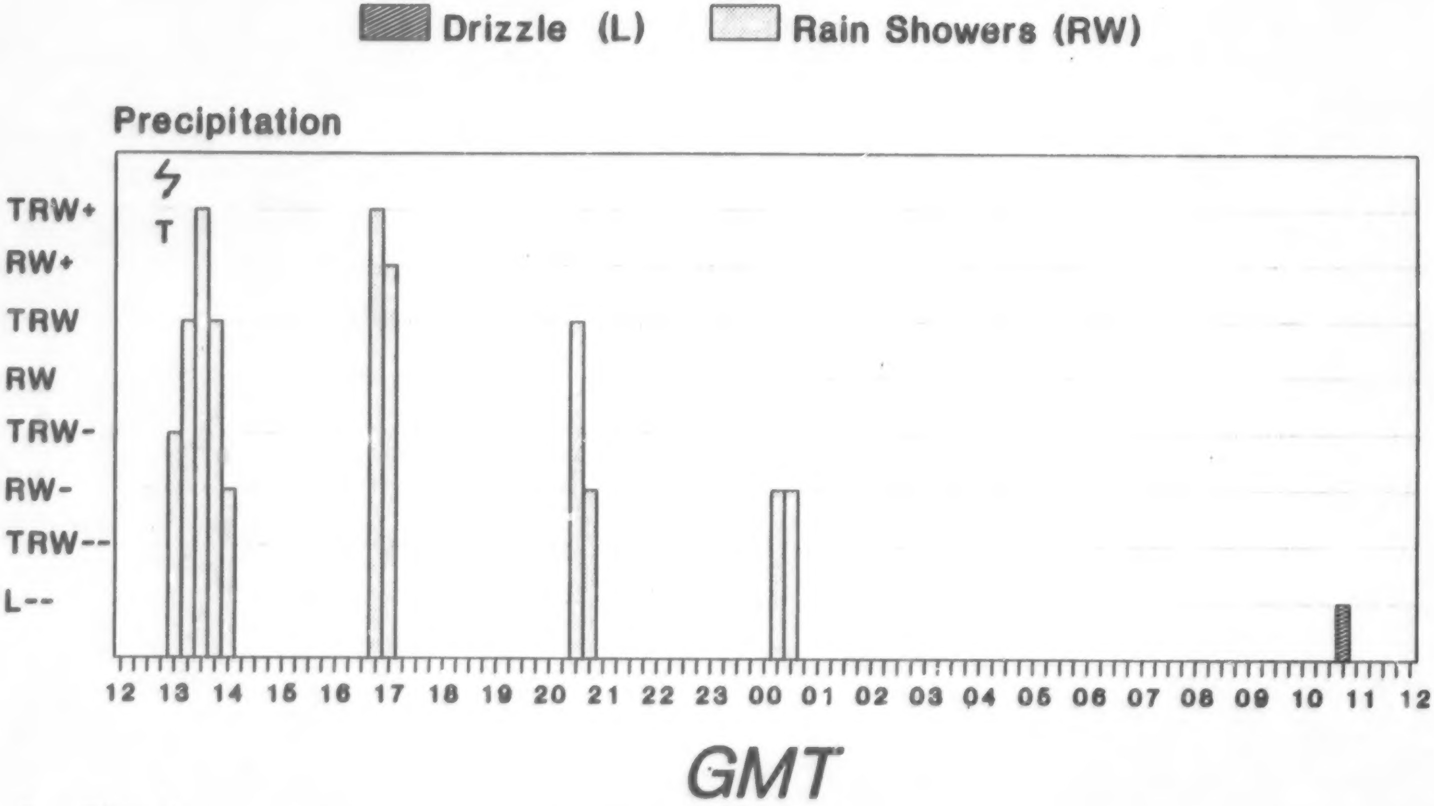

100°
90°
80°
50N
40N
996
1000
1004
1008
1012
1016
1020
1024
1020
1024
1020
L
1014
CHALK RIVER
DORSET
LONGWOODS
H
1027
H
1027
H
1028
SURFACE ANALYSIS
August 27, 1986
1200 Z

FIGURE 1.19.2

London A

Aug. 26-27, 1985

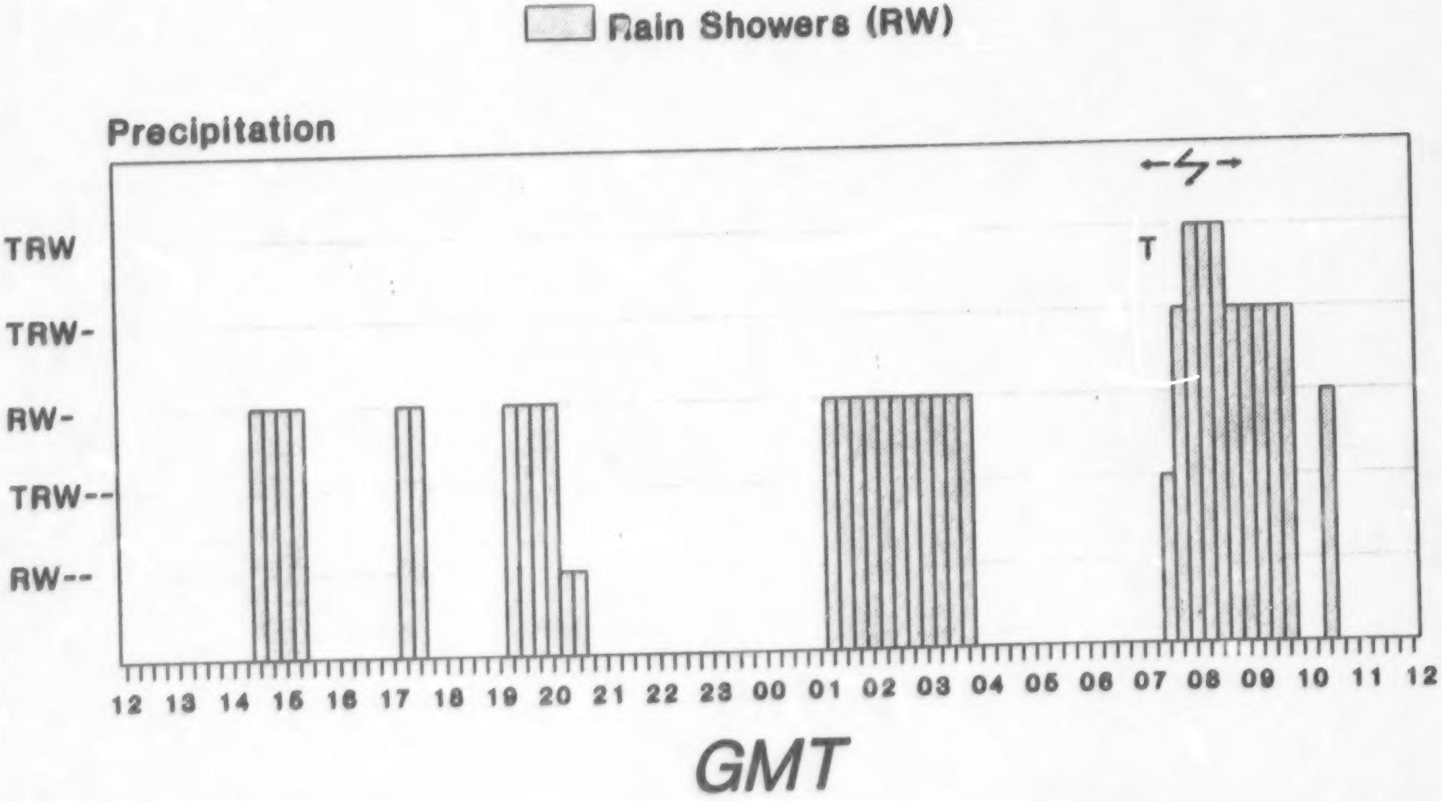


T - Thunder

FIGURE 1.19.3A

Petawawa A

Aug. 26-27, 1985



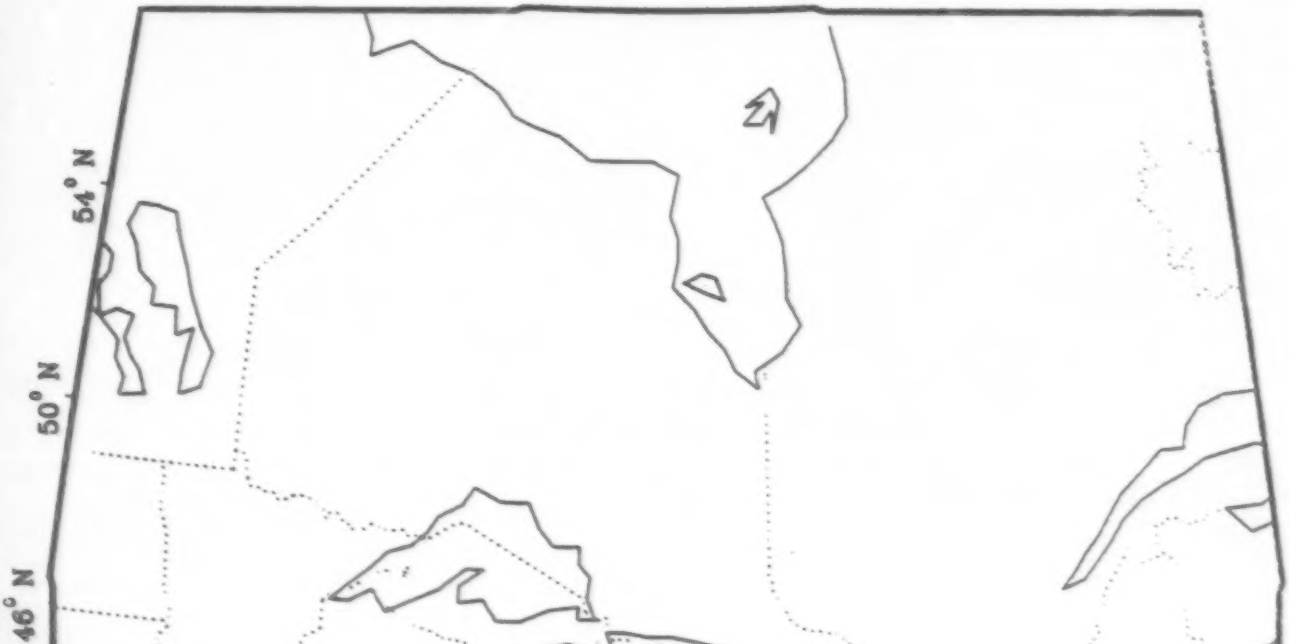
T - Thunder

FIGURE 1.19.3B

72 HOUR TRAJECTORIES
MON AUG26 85 12 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□



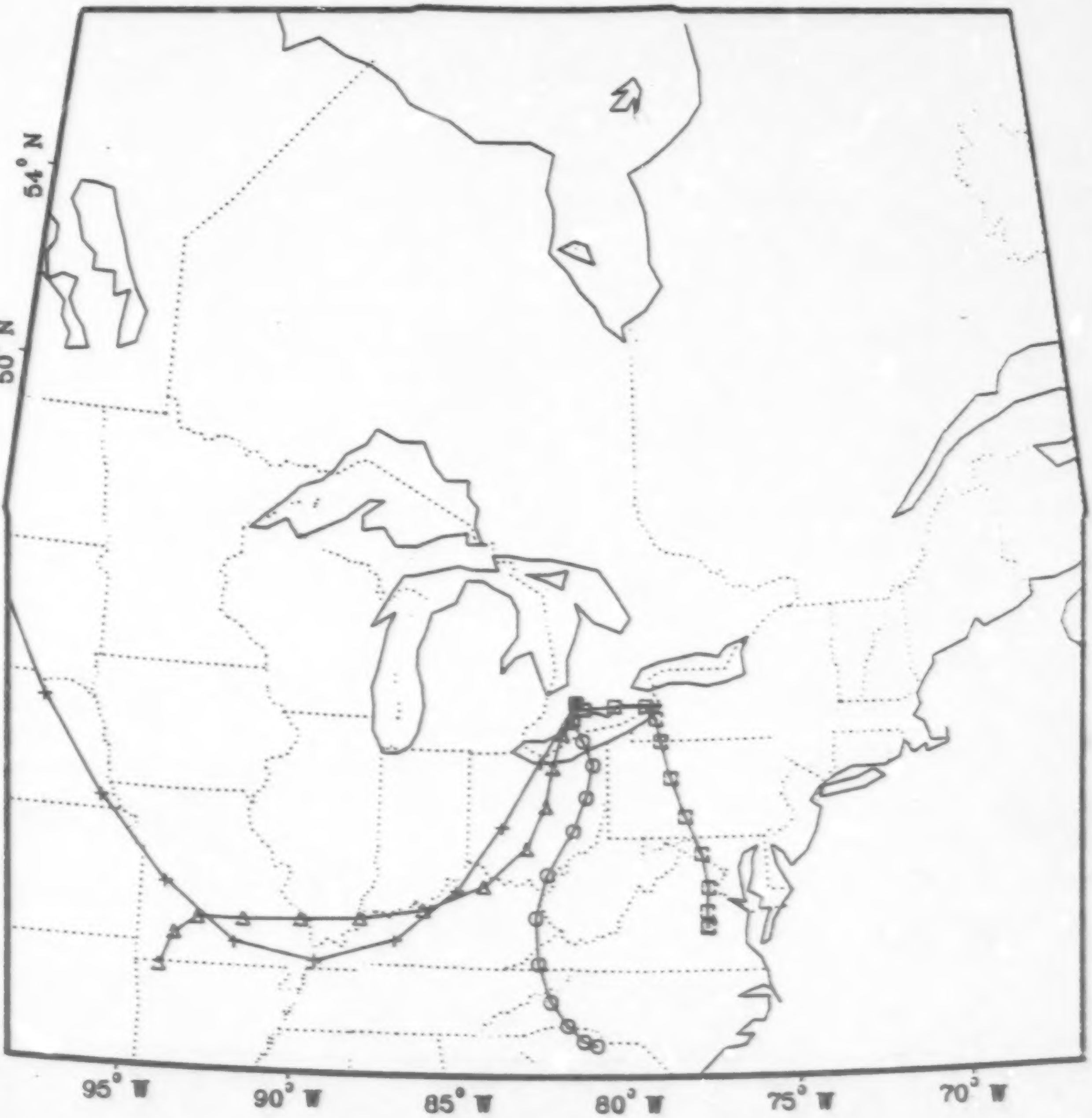
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.4

72 HOUR TRAJECTORIES
MON AUG26 85 18 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.5

72 HOUR TRAJECTORIES
TUE AUG27 85 0 Z
LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

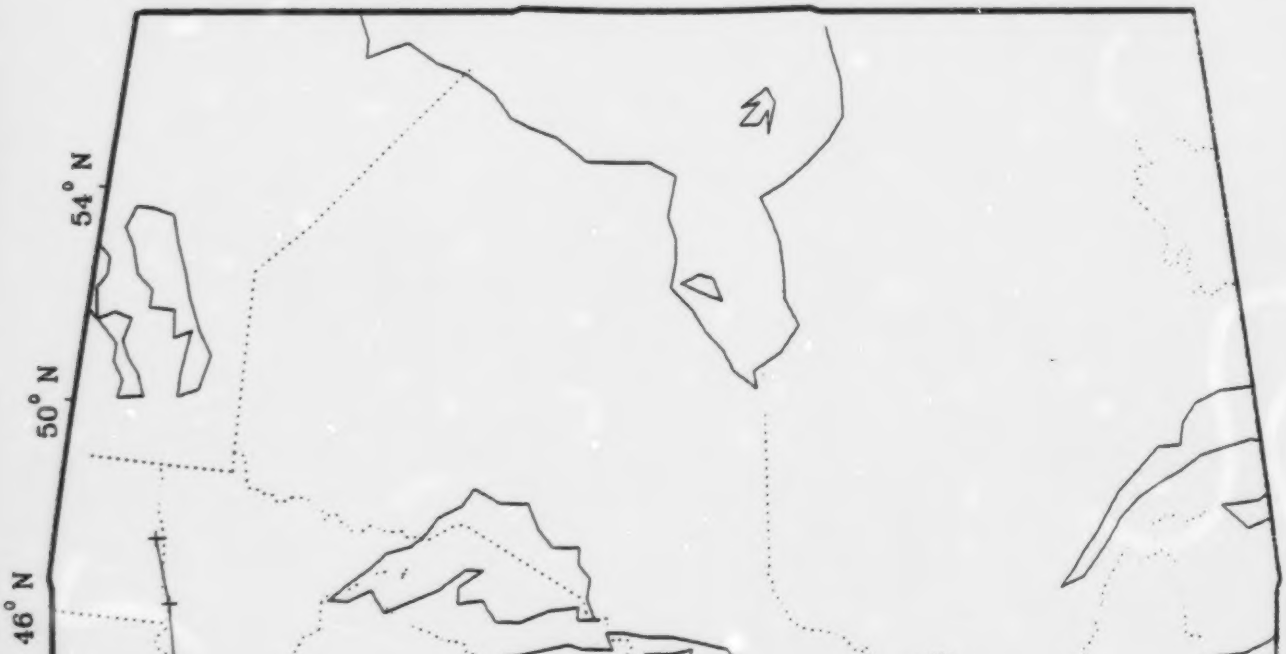

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.6

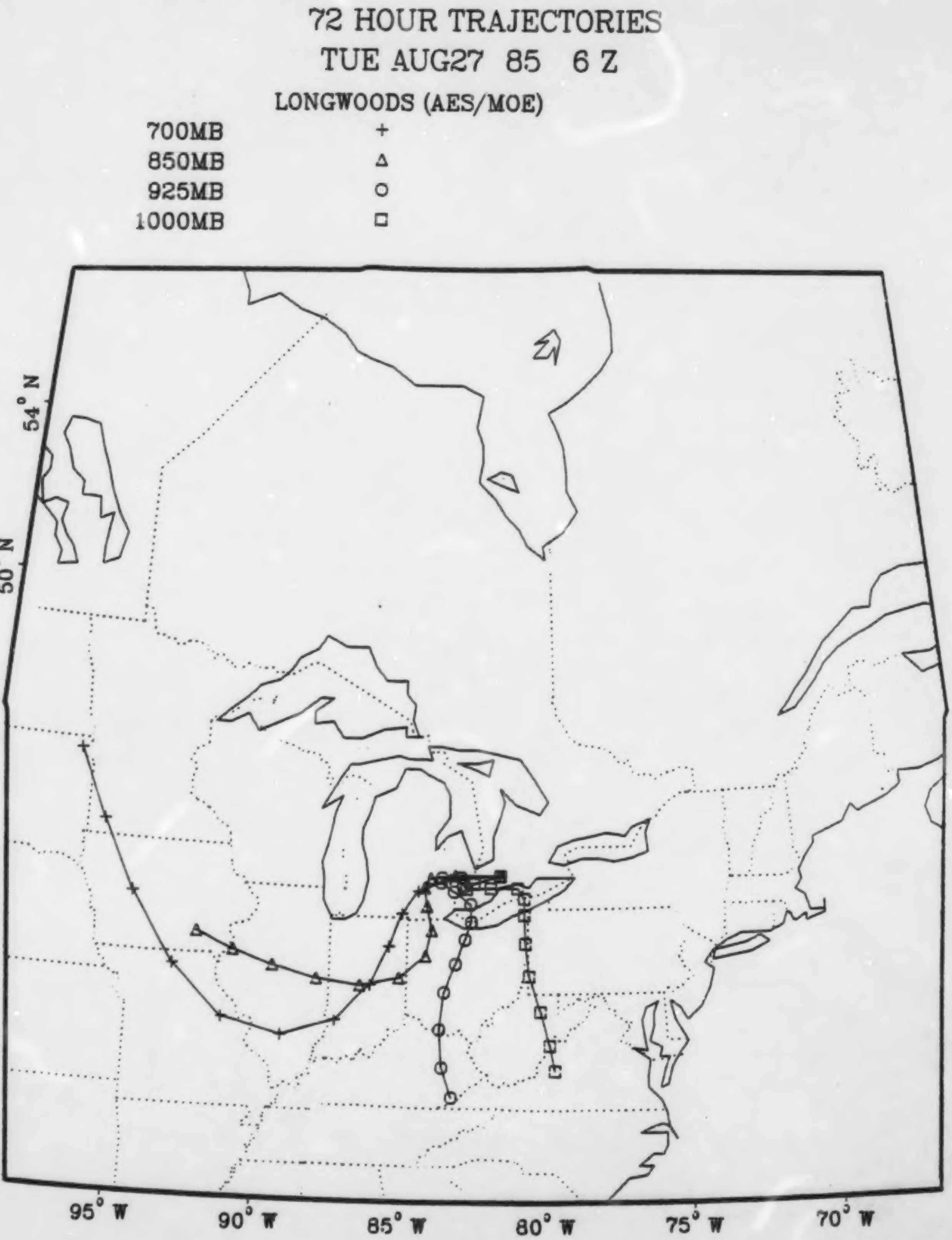

72 HOUR TRAJECTORIES
TUE AUG27 85 6 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.7

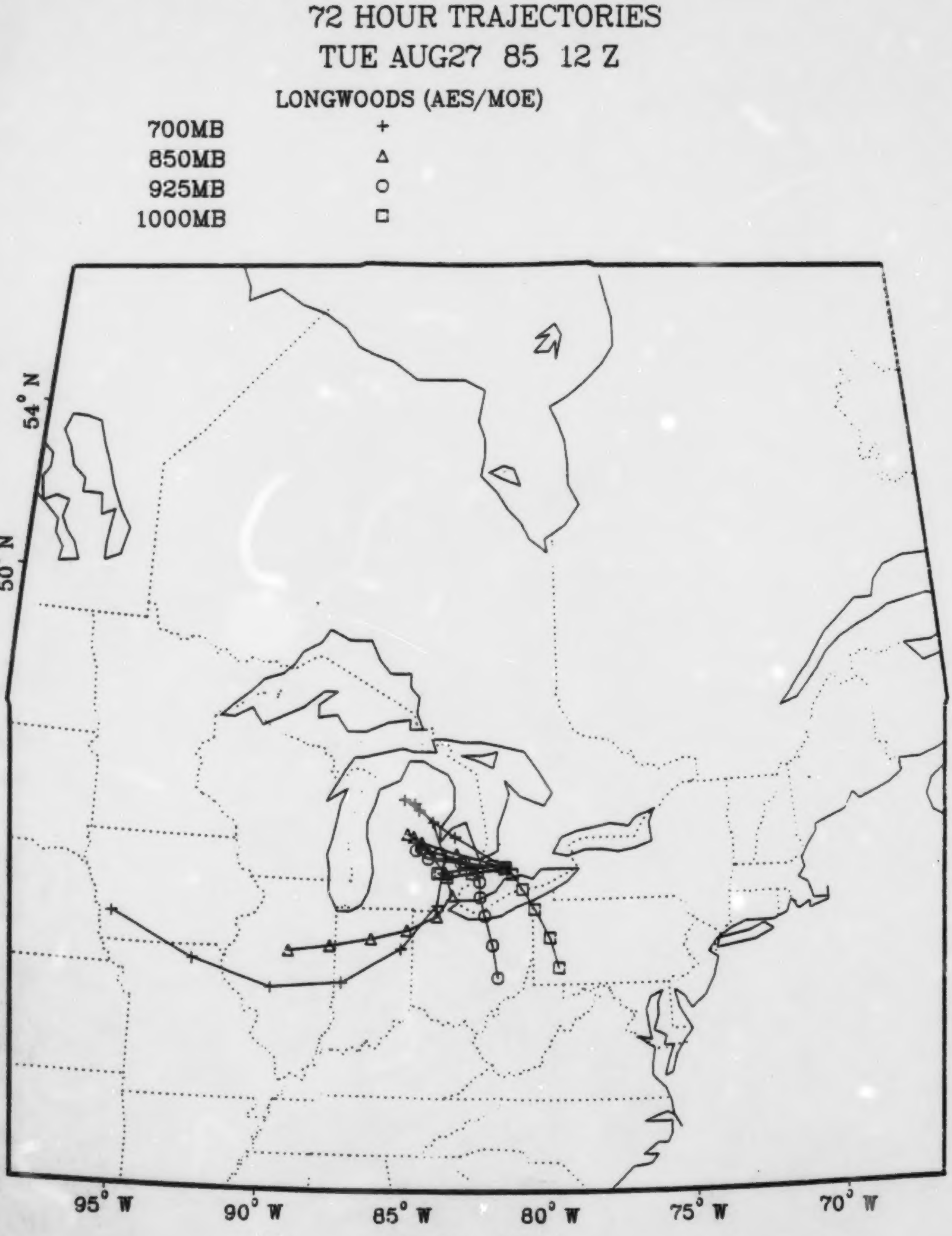

72 HOUR TRAJECTORIES
TUE AUG27 85 12 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.8

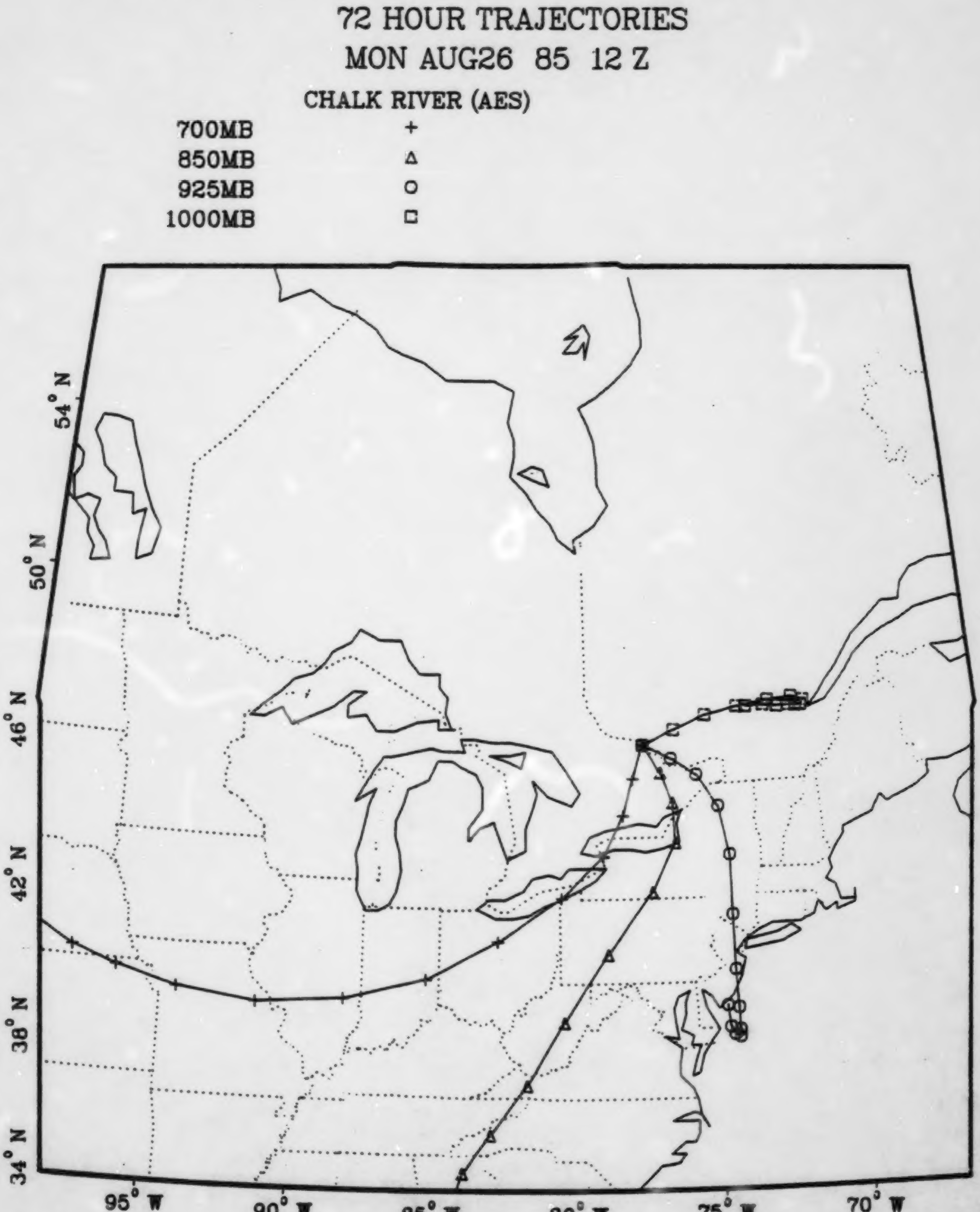

72 HOUR TRAJECTORIES
MON AUG26 85 12 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.9

72 HOUR TRAJECTORIES
MON AUG26 85 18 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

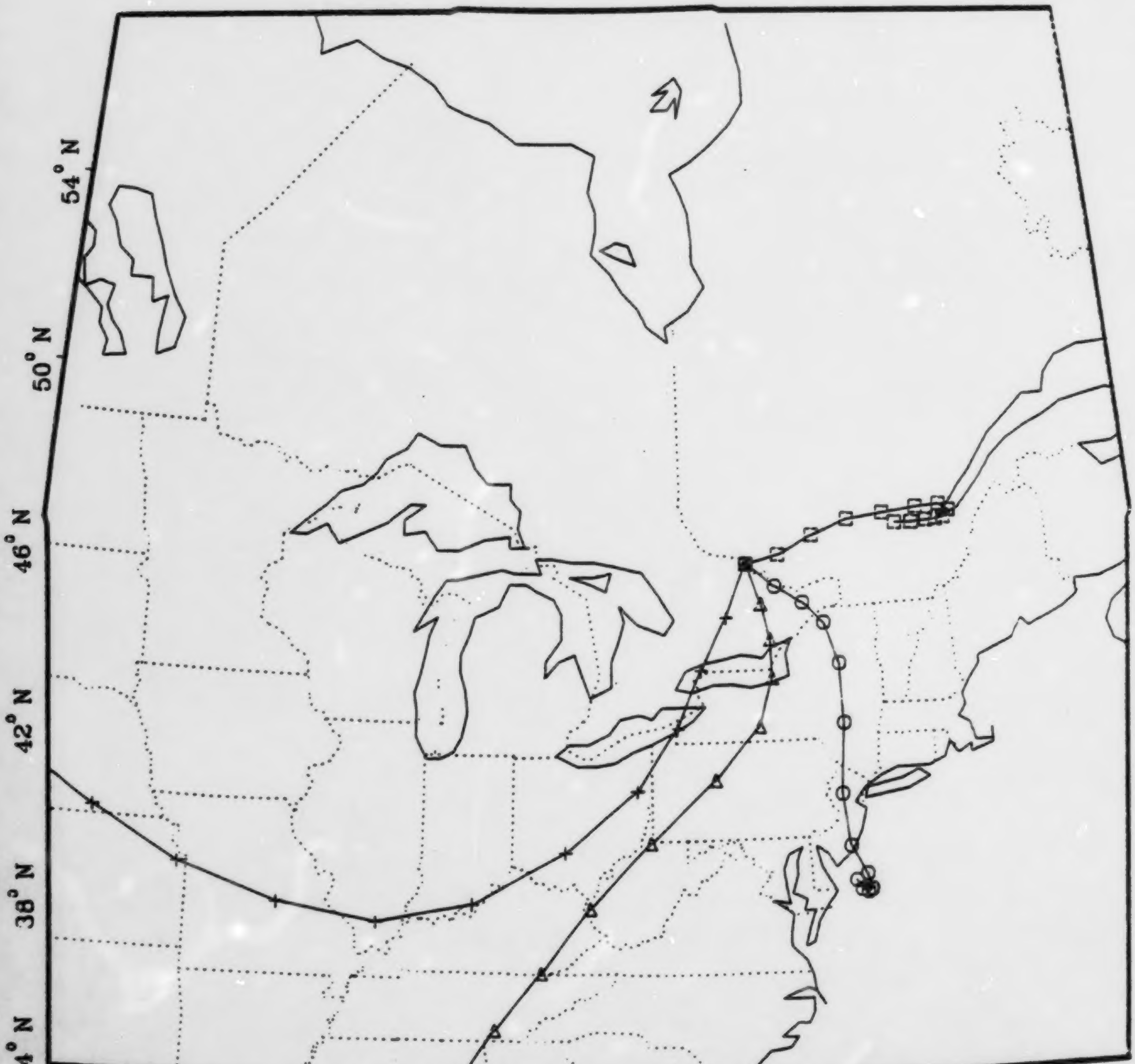

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.10

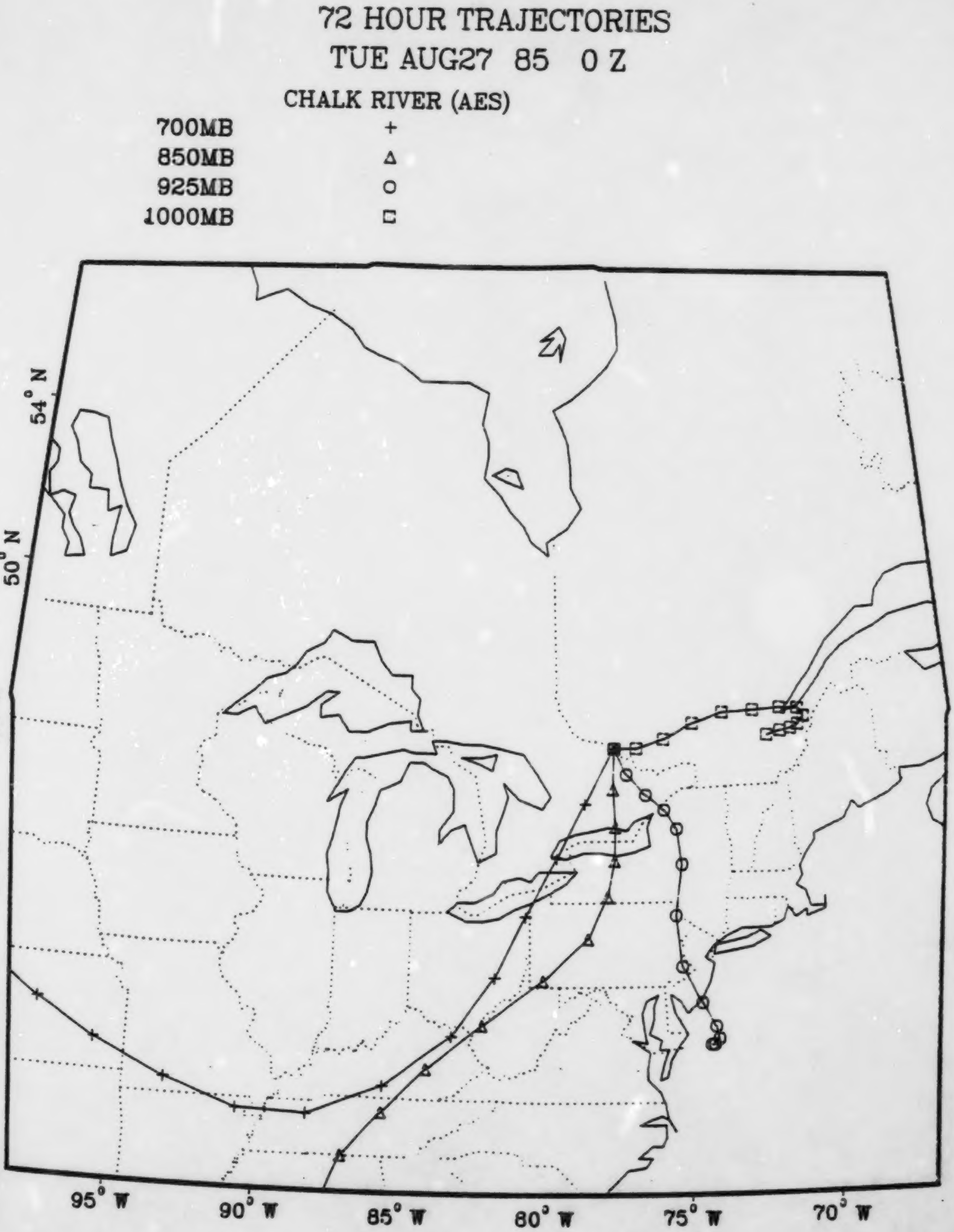

72 HOUR TRAJECTORIES
TUE AUG27 85 0 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.11

72 HOUR TRAJECTORIES
TUE AUG27 85 6 Z
CHALK RIVER (AES)

700MB +
850MB △
925MB ○
1000MB □

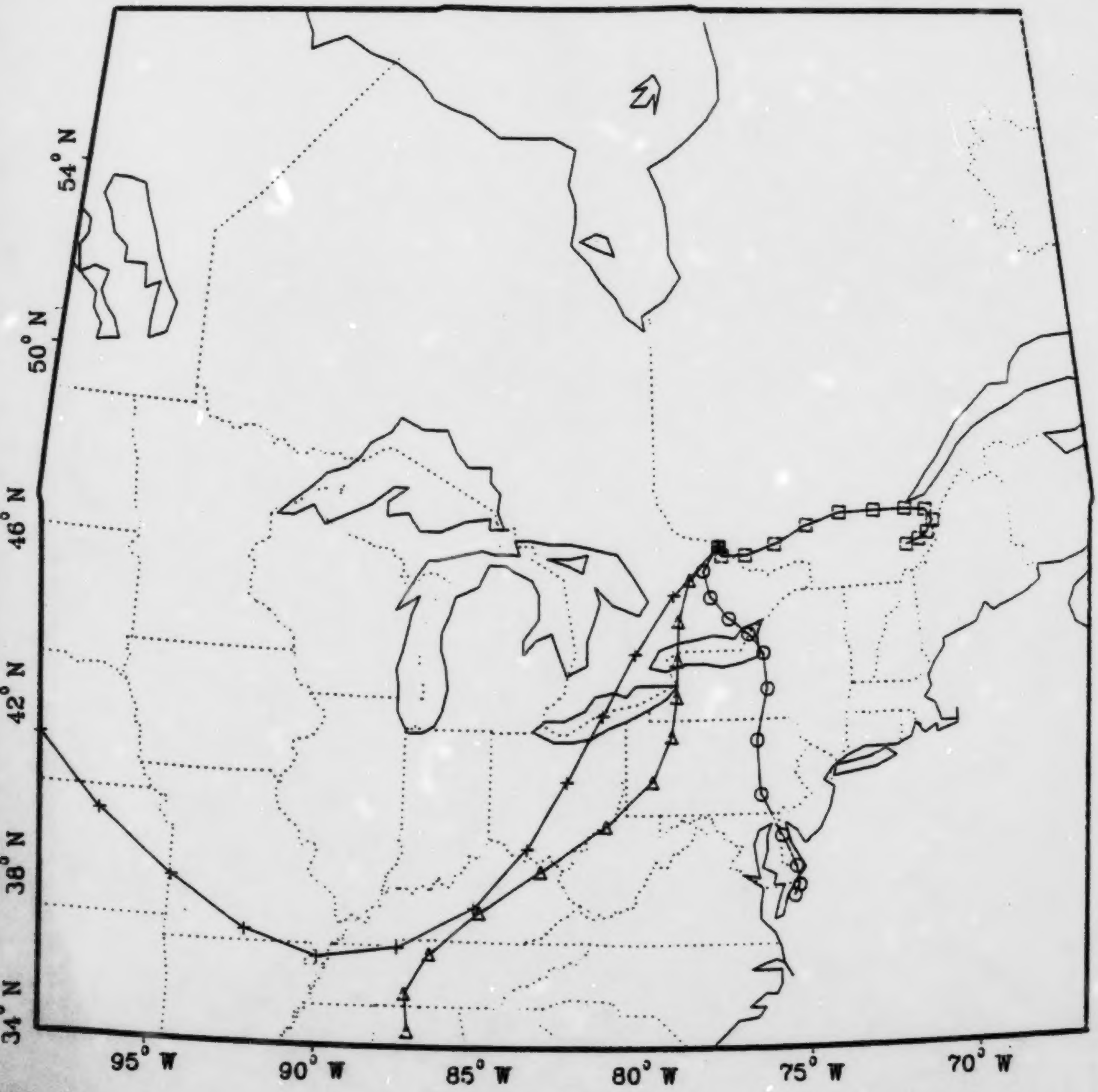

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.12

72 HOUR TRAJECTORIES
TUE AUG27 85 12 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

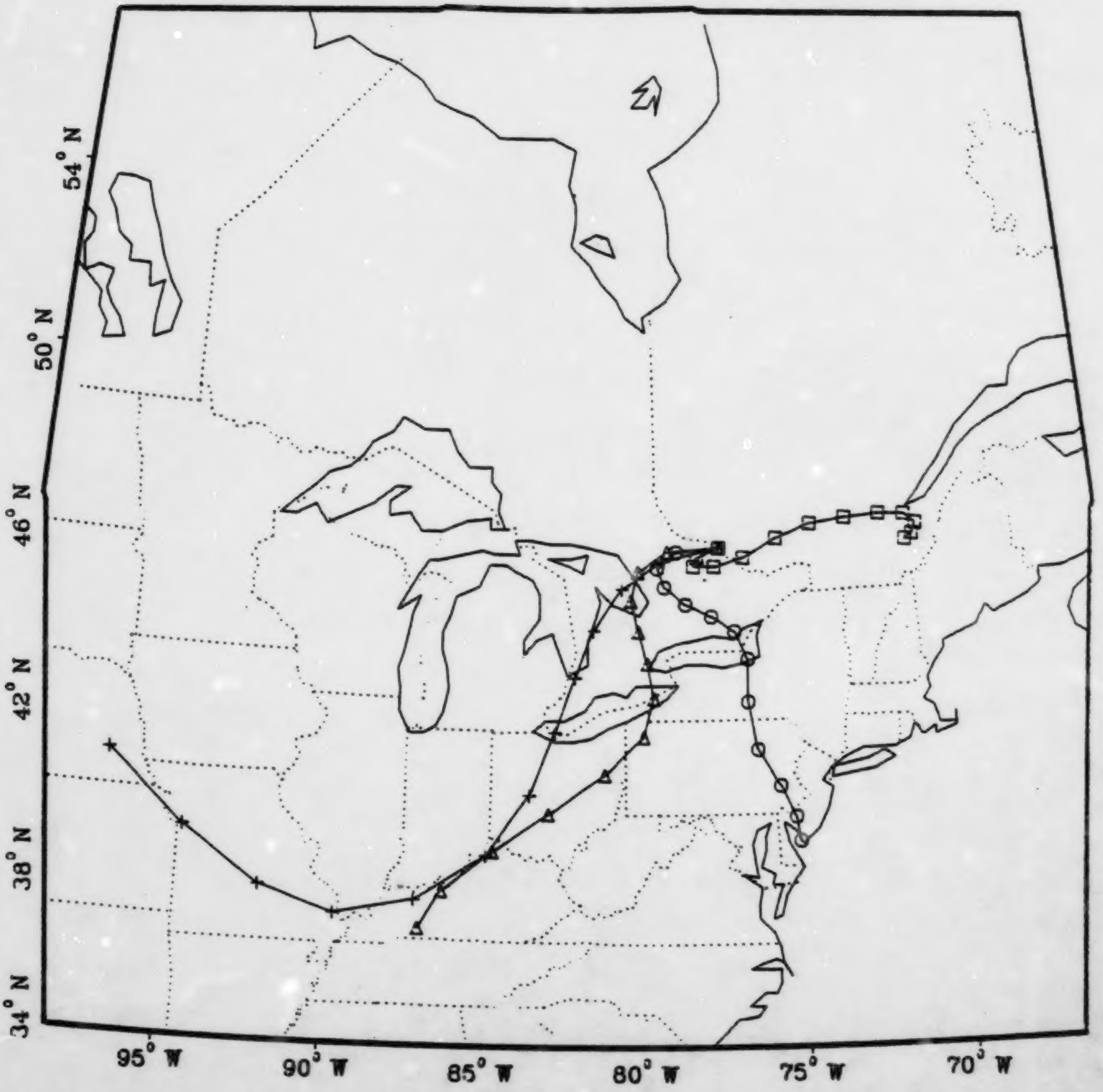

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.19.13

1.20 August 29-30, 1985, Dorset

The event was ranked 5th (5/8) for only $SO_4^=$ top 25% wet deposition events.

A wave with a warm front over Lake Huron was analyzed on August 29 at 12Z as shown in Fig. 1.20.1. During the duration of this episode, the warm front did not pass over the station but remained close and on August 30, at 12Z a low pressure centre of 1010 mb near Hamilton with the warm front passing over Buffalo was observed as shown in Fig. 1.20.2. The warm front gave rise to showery weather intermittently in the area and very light & light showers were recorded at Muskoka, as exhibited in Fig. 1.20.3. Light drizzle also fell at the station at the end of episode for a few hours.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for August 29, at 12Z, 18Z and August 30, at 00Z, 06Z and 12Z are shown in Figures 1.20.4, 1.20.5, 1.20.6, 1.20.7 and 1.20.8 respectively.

Air parcels arriving at 1000 mb level show that SO_2 from the highest emission Sudbury area could have been transported on Aug 30, during 00Z-06Z, as shown in Figs. 1.20.6&7.

Air trajectories for the 925 mb level show that SO_2 from the highest emission Sudbury area on August 30, at 00Z (see Fig. 1.20.6) and from high Toronto area at 06-12Z (Figs. 1.20.7-8) could have been transported.

Air trajectories for the 850 mb level show that SO_2 from the highest emission sudbury area on August 29, during 12Z - 18Z as shown in Figs. 1.20.4-5, and from high Sarnia area on August 30, during 06-12Z as illustrated in Figs. 1.20.7-8, could have been transported from these regions.

Air parcels arriving at 700 mb level could have transported SO_2 from the highest emission Sudbury area on August 29, at 12Z as shown in Fig. 1.20.4.

In summary a nearby warm front yielded rain showers intermittently. Light drizzle also fell for a few hours.

SO_2 from the highest emission Sudbury area at low and high levels, and from the high emission Toronto area at low level (925 mb) and Sarnia area at high level (850 mb) could have been transported.

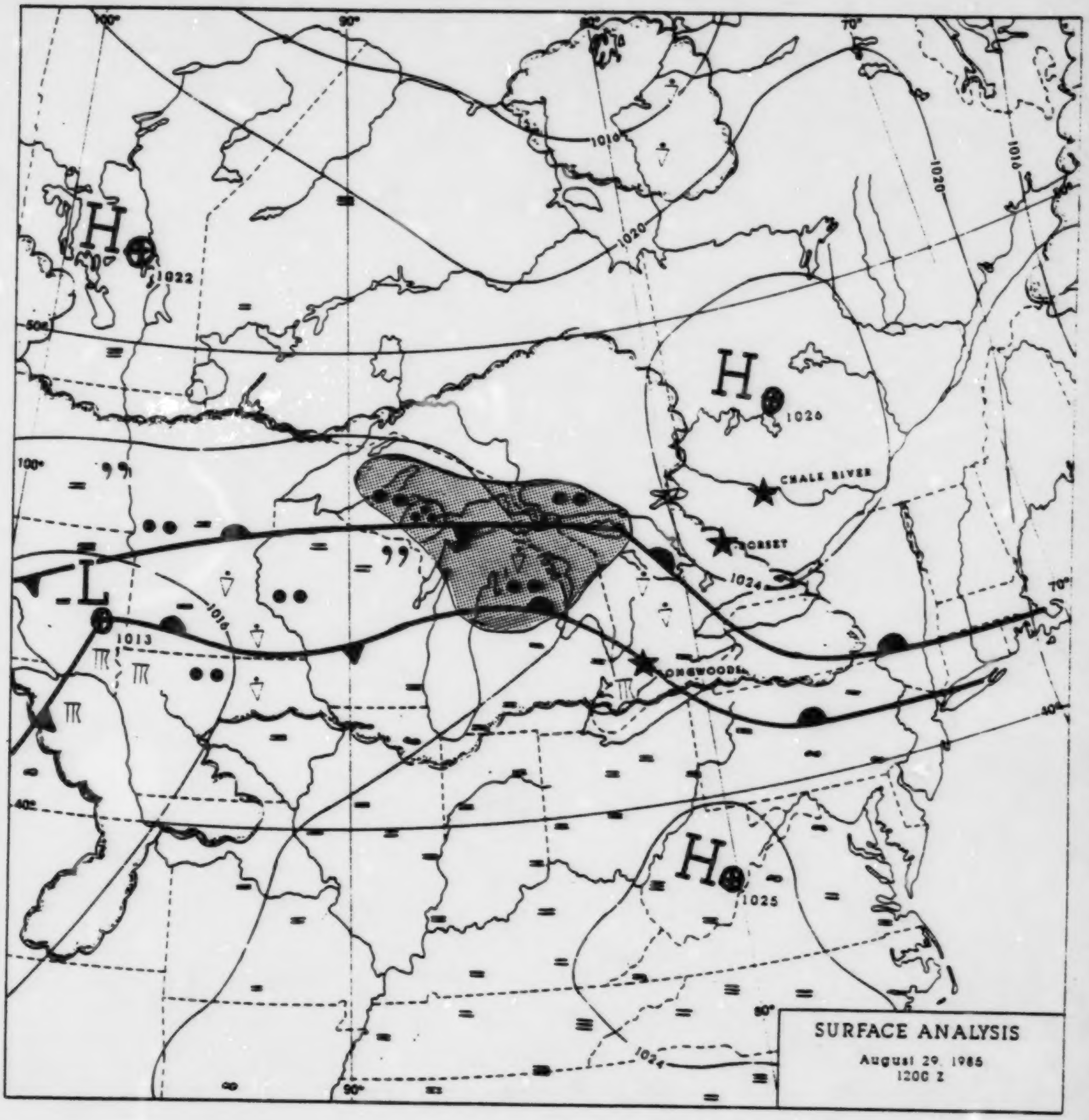

SURFACE ANALYSIS
August 29, 1985
1200 Z
H
1022
H
1026
H
1025
L
1013
1016
1020
1024
CHALK RIVER
DORSET
LONGWOODS
100°
90°
80°
70°
50°
40°

FIGURE 1.20.1

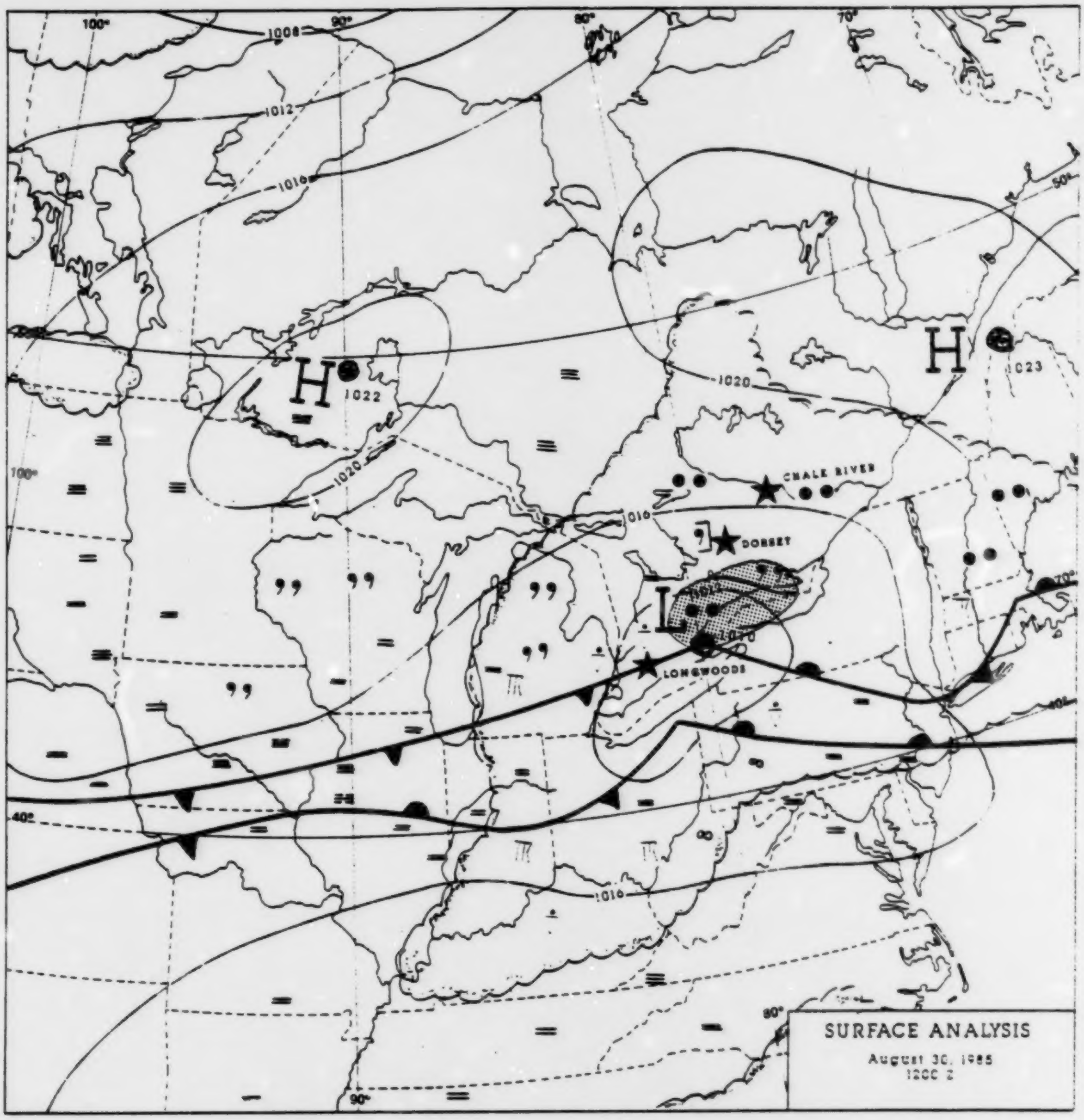

100°
90°
80°
70°
50°
40°
1008
1012
1016
1020
1022
1023
H
L
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
August 30, 1985
1200 Z

FIGURE 1.20.2

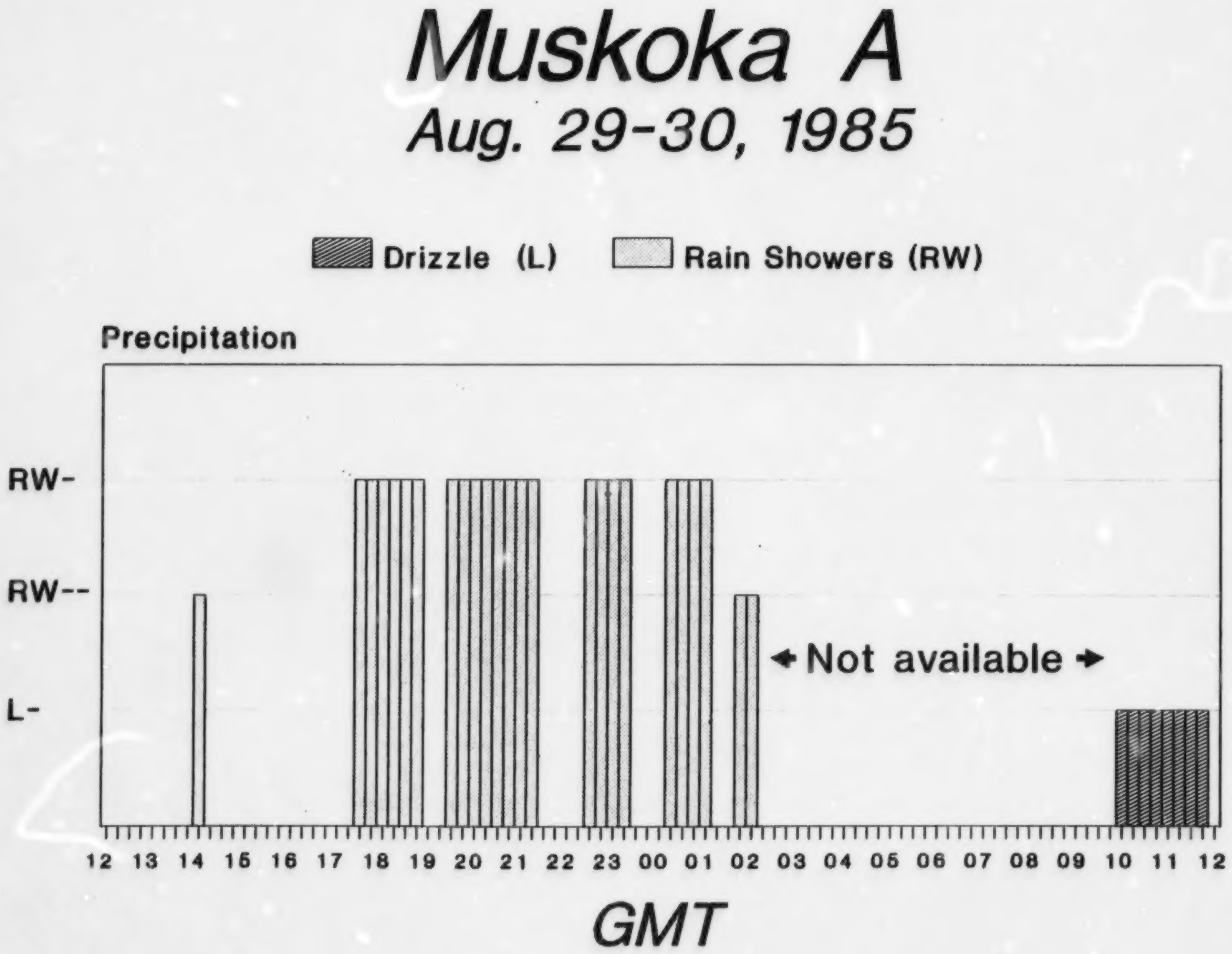
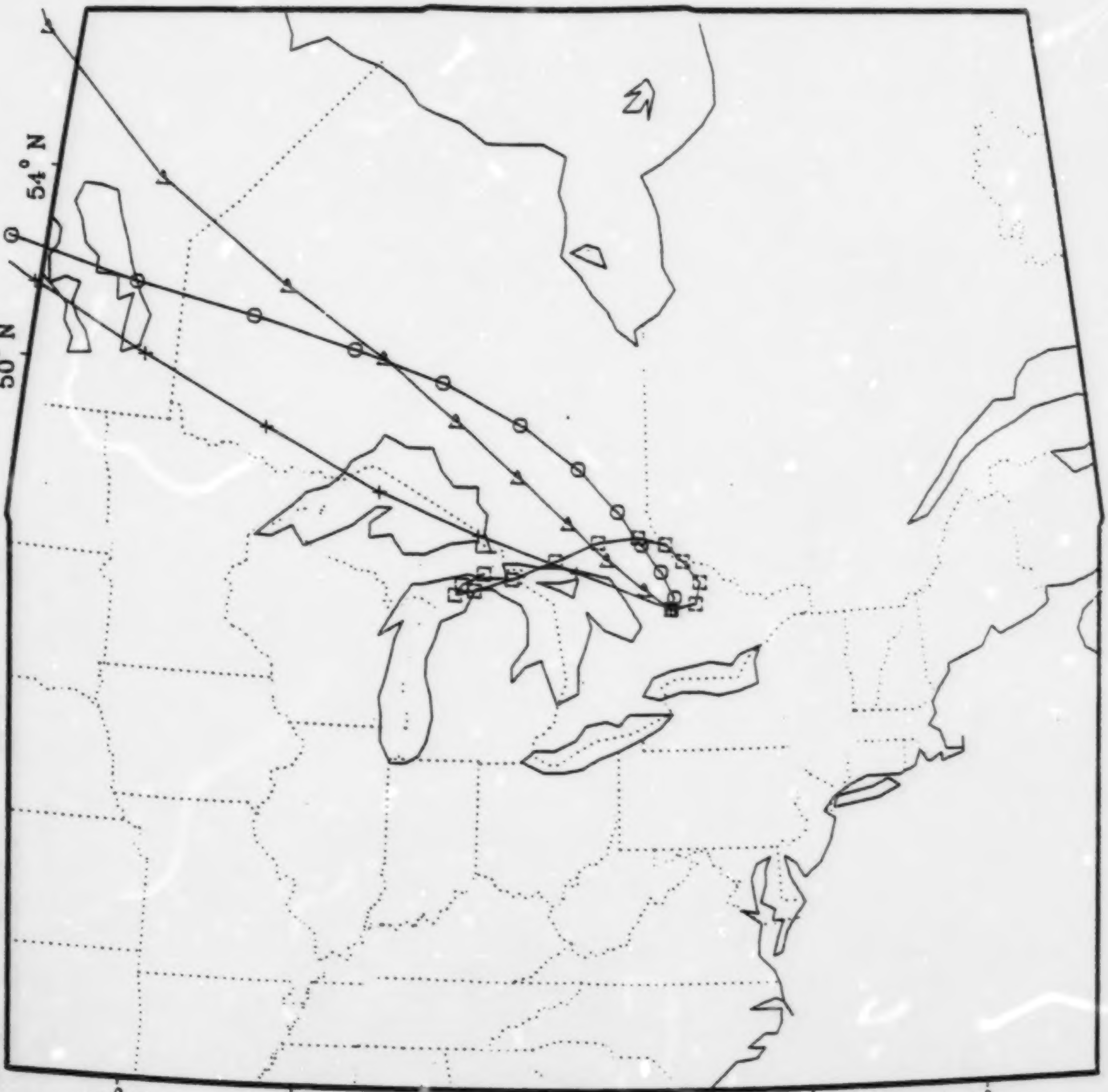

Muskoka A
Aug. 29-30, 1985
▨ Drizzle (L)
☐ Rain Showers (RW)
Precipitation
RW-
RW--
L-
← Not available →
12
13
14
15
16
17
18
19
20
21
22
23
00
01
02
03
04
05
06
07
08
09
10
11
12
GMT

FIGURE 1.20.3

72 HOUR TRAJECTORIES
THU AUG29 85 12 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.20.4

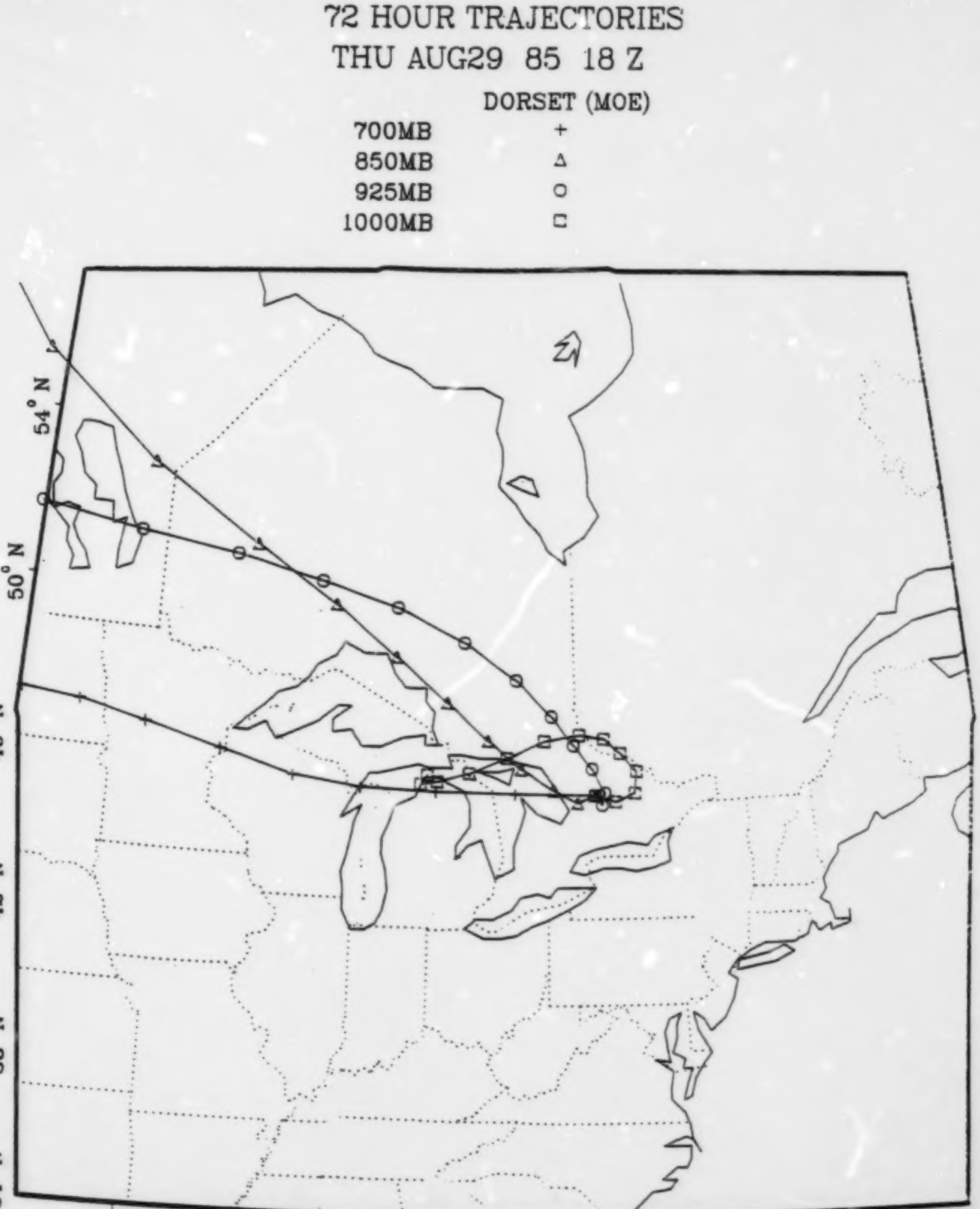

72 HOUR TRAJECTORIES
THU AUG29 85 18 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.20.5

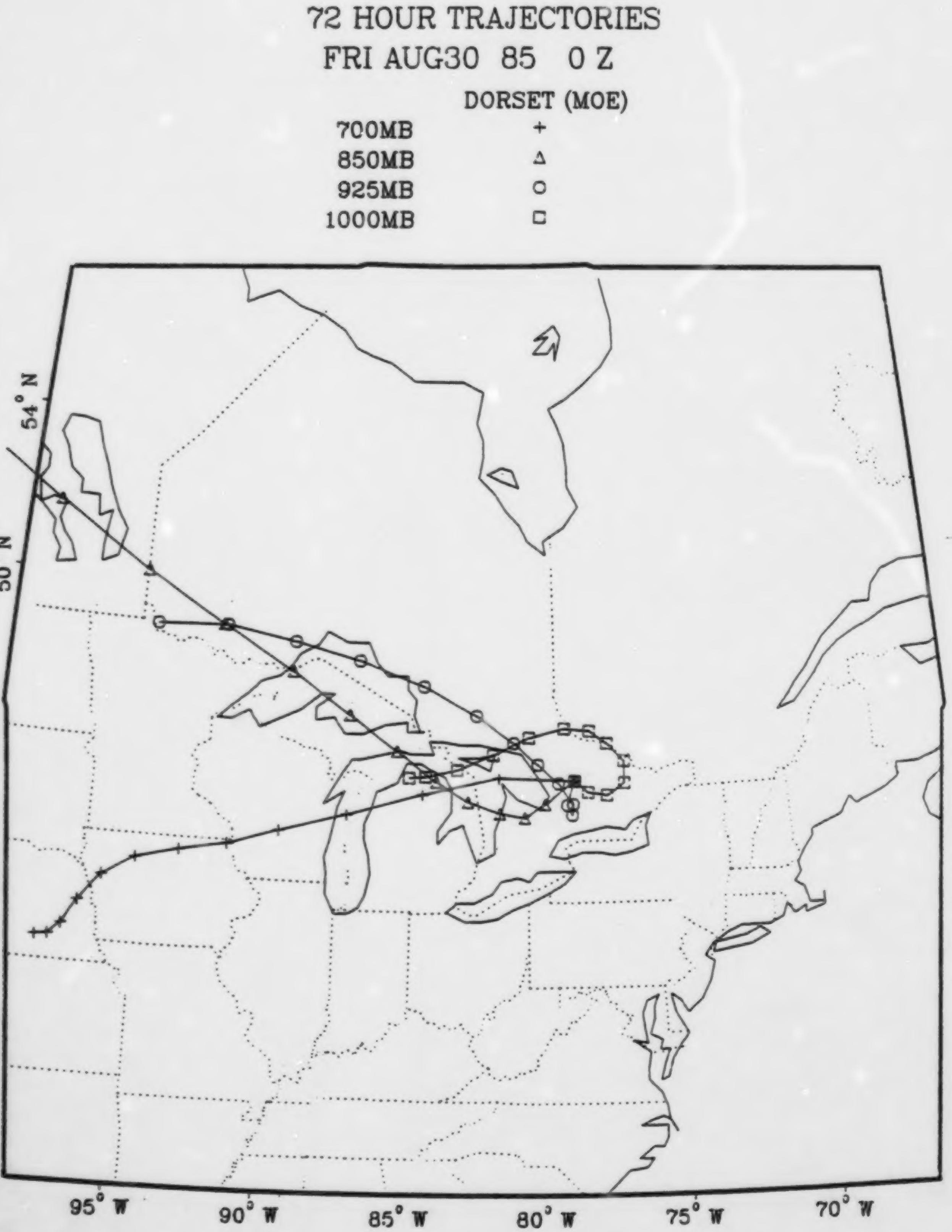

72 HOUR TRAJECTORIES
FRI AUG30 85 0 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.20.6

72 HOUR TRAJECTORIES
FRI AUG30 85 6 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

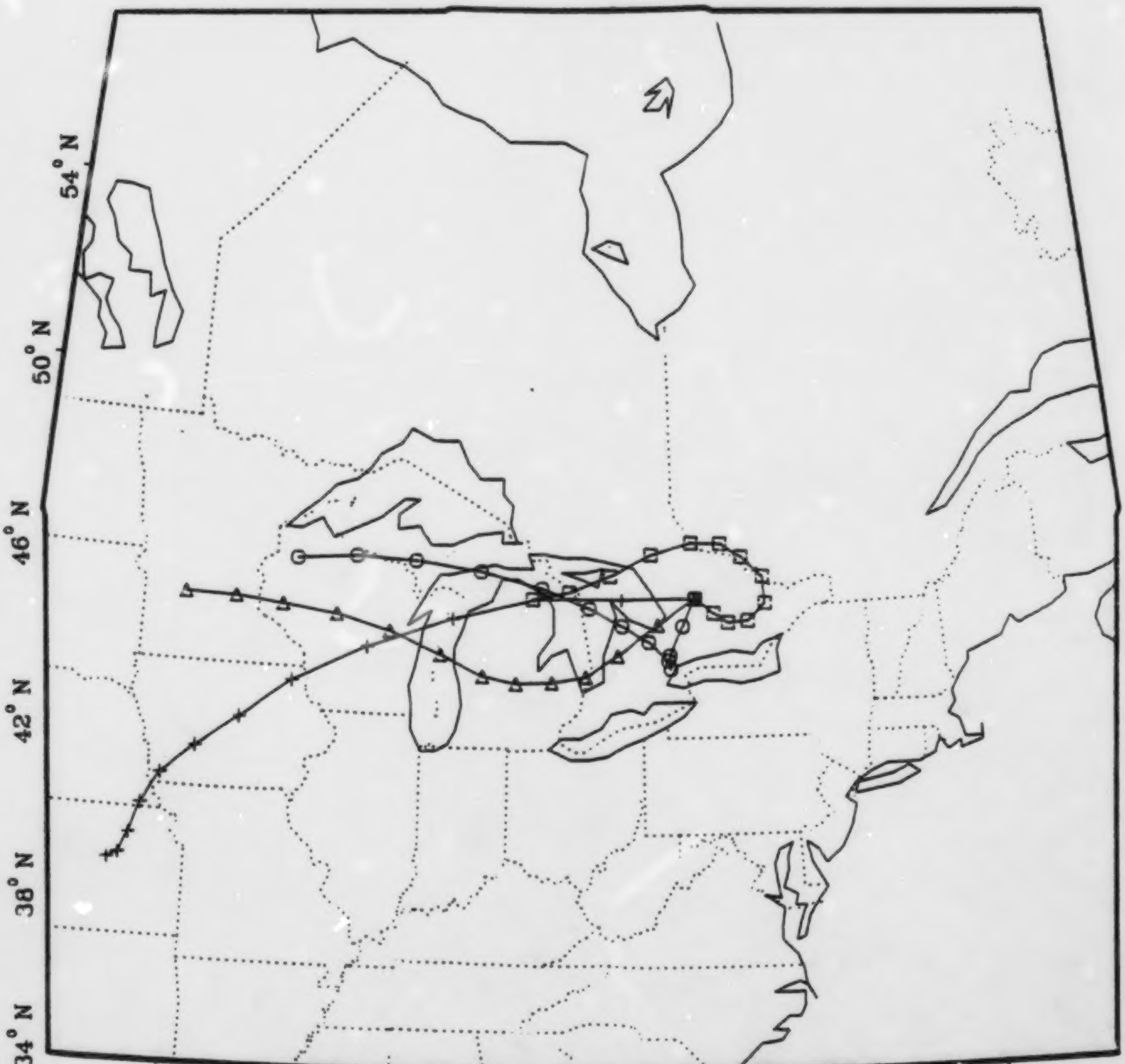

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.20.7

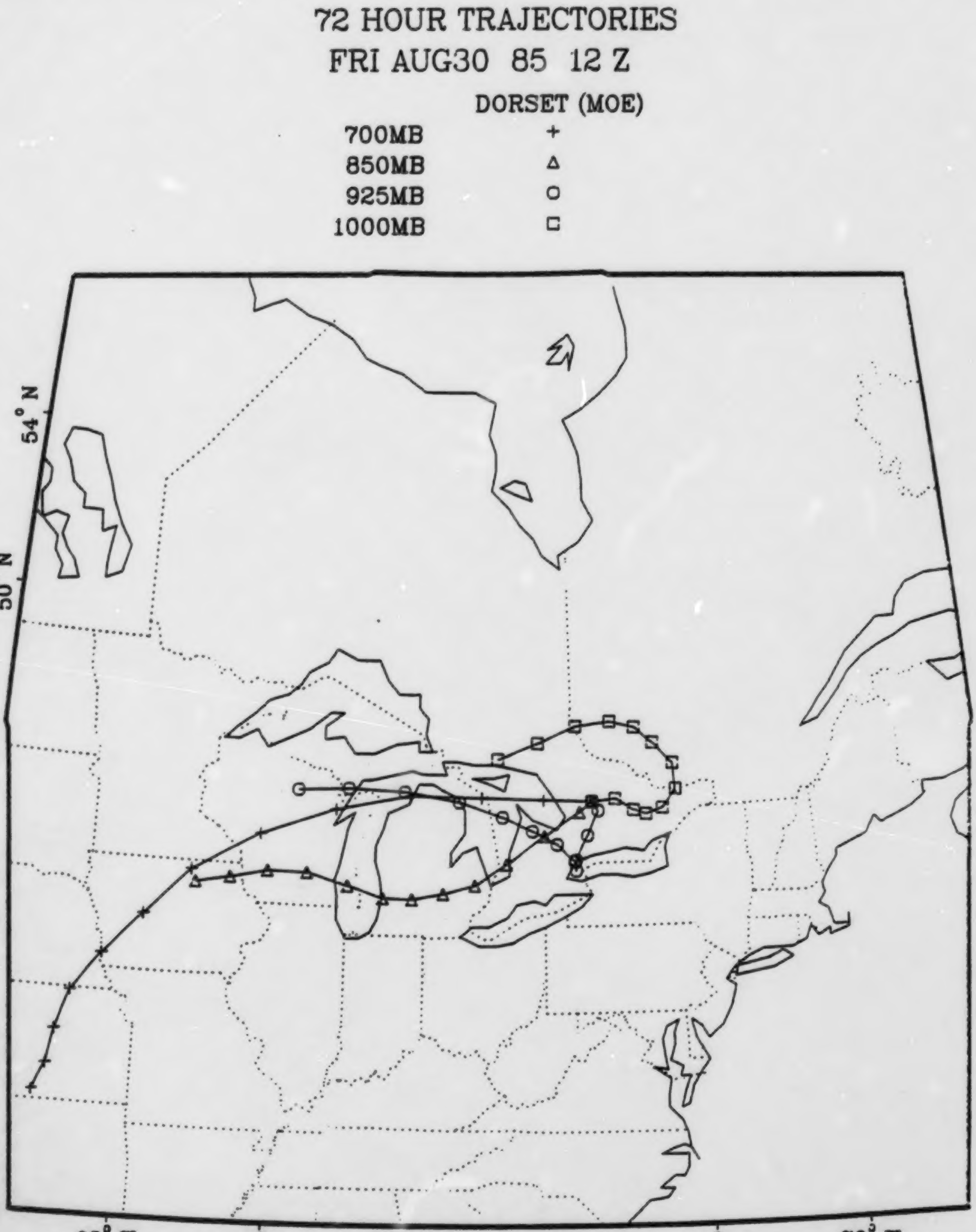

72 HOUR TRAJECTORIES
FRI AUG30 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.20.8

1.21 September 3-4, 1985. Dorset

This episode was ranked 3rd (3/8) for $SO_4^=$ and 9th (9/12) for NO_3^- wet deposition events.

A low pressure centre, 1004 mb, over Lake Superior with the warm front over Lake Huron close to Dorset and a wave with another frontal system were analyzed on September 3, at 12Z, as shown in Fig. 1.21.1. As shown in the figure, a continuous precipitation band was associated with this system. The warm fronts crossed over Dorset on September 3, and the station remained in the warm sector from 00Z on September 4 until 12Z when the cold front was located right over it as shown in Fig. 1.21.2. Light rain showers were observed at Muskoka as the warm front passed over on September 3 and the cold front approached on September 4, as shown in Fig. 1.21.3. Lightning was observed at some distance from the station.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for September 3, at 12Z, 18Z and September 4, at 00Z, 06Z and 12Z are shown in Figures 1.21.4, 1.21.5, 1.21.6, 1.21.7 and 1.21.8 respectively.

Air parcels arriving at 1000 mb level could have carried SO_2 from its high emission Sudbury area on September 3, at 18Z (see Fig. 1.21.5), from Ohio on September 4, at 06Z (see Fig. 1.21.7) and from Detroit area at 12Z, as shown in Fig. 1.21.8. No highest NO_x emission sources are involved for the transport at this level; however transport from high emission area in Ohio(Fig. 1.21.7) and Detroit area(Fig. 1.21.8) were possible.

Air trajectories for the 925 mb level show that SO_2 and NO_x from their highest emission Chicago area could have been transported as shown in Fig. 1.21.7. Transport of SO_2 from the other area in Illinois was also likely during 06Z-12Z on September 4, as exhibited in Figs. 1.21.7-8.

Air trajectories for the 850 mb level show that SO_2 from the highest emission Chicago and other area in Illinois and the NO_x from the Chicago area could have been transported as shown in Figs. 1.21.4-5.

Air trajectories for the 700 mb level show that transport from any highest emission source was unlikely as the trajectories did not cross over any such area.

In summary, the passage of two warm fronts and the arrival of a cold front gave brief rain showers. Lightning was observed at the approach of the cold front. Low level transport(1000 mb & 925 mb) of SO_2 from a number of sources, viz., Sudbury, Ontario, Detroit, Michigan, Chicago, Illinois, and other areas in Illinois & Ohio, and NO_x form Chicago was likely. High level transport(850 mb) of SO_2 and NO_x from Chicago and SO_2 from other area in Illinois was probable. It appears that during this episode high level transport was less significant since the transport only occurred for a few hours and only at one level(850 Mb) from the highest emission sources.

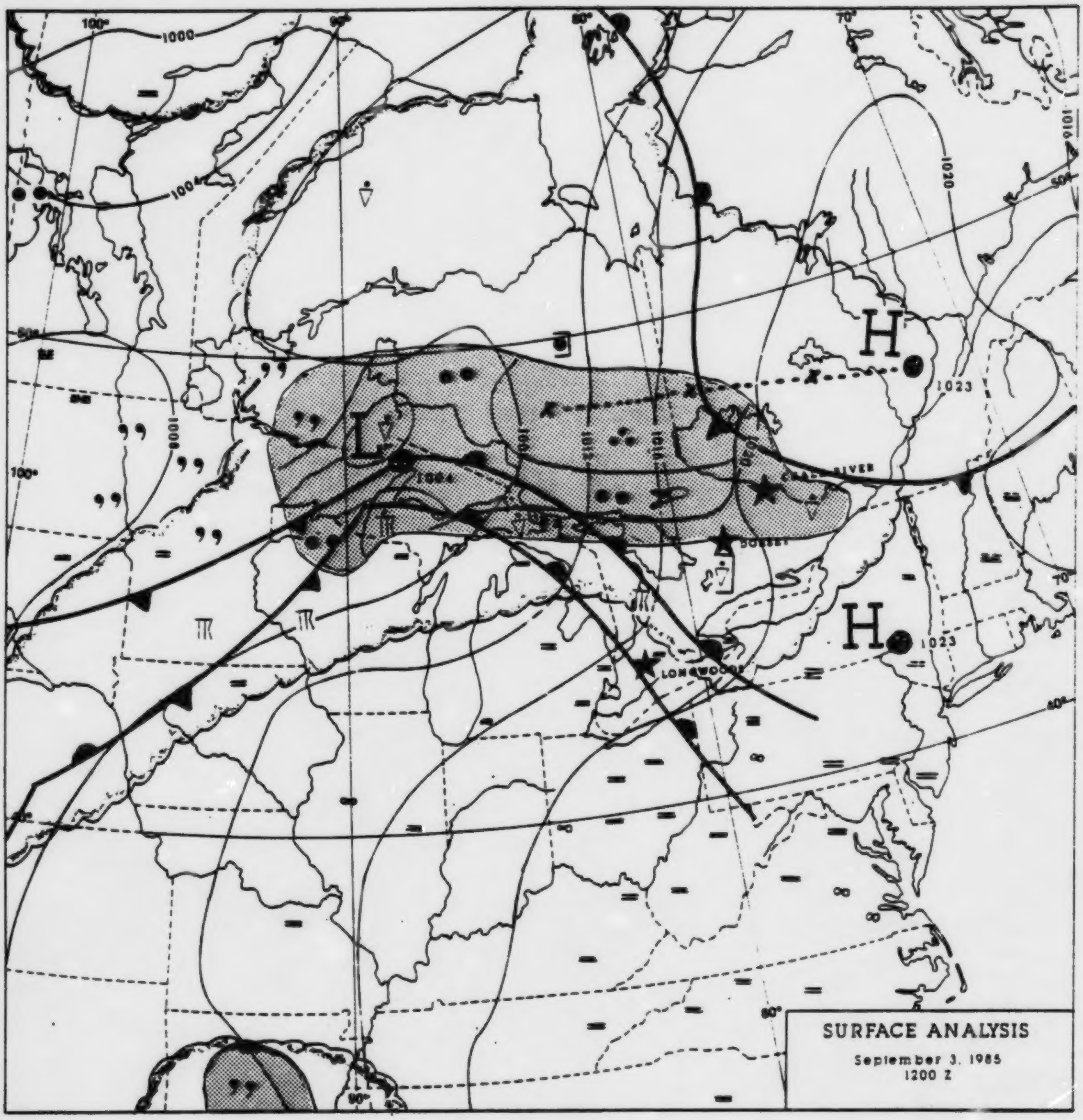
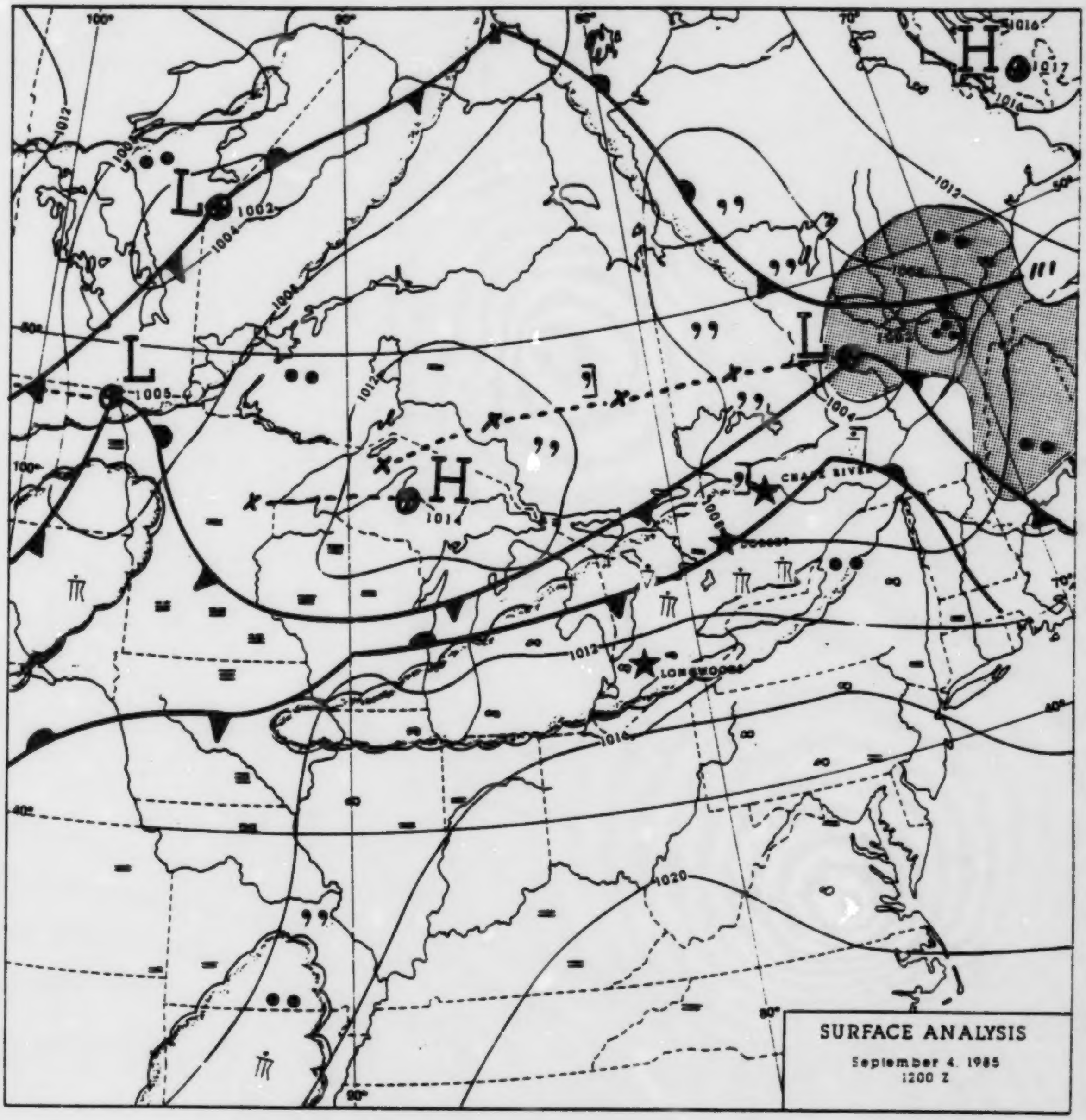

SURFACE ANALYSIS
September 3, 1985
1200 Z
H
H
L
1000
1004
1008
1012
1016
1020
1023
1023
1016
DORSET
LONGWOODS
RIVER
100°
90°
80°
70°
50°
40°

FIGURE 1.21.1



SURFACE ANALYSIS

September 4, 1985
1200 Z

L
L
L
H
H
1002
1004
1005
1008
1012
1014
1016
1017
1020
CHALK RIVER
DORSET
LONGWOODS
100°
90°
80°
70°
50°
40°

FIGURE 1.21.2

Muskoka A

Sep. 3-4, 1985

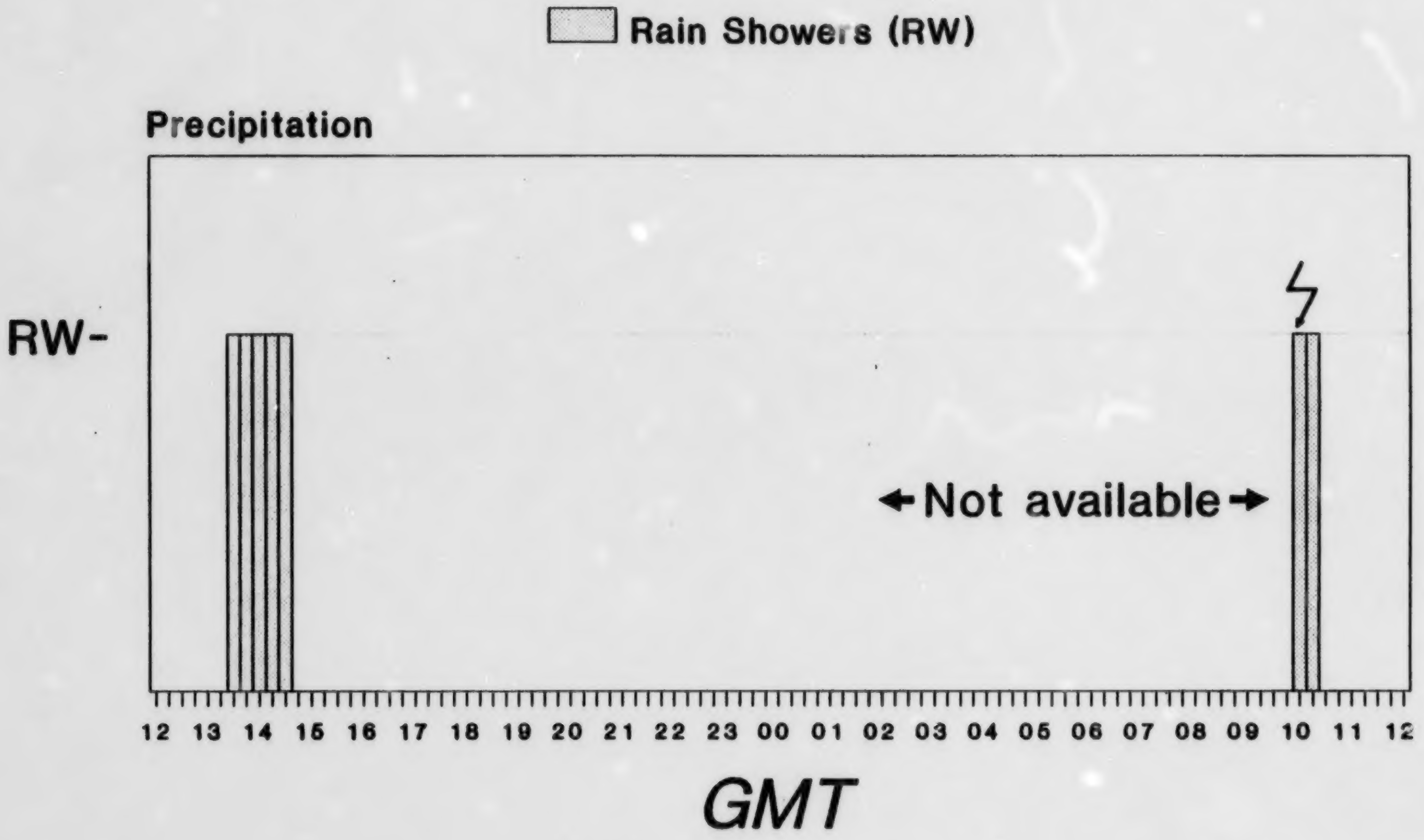


FIGURE 1.21.3

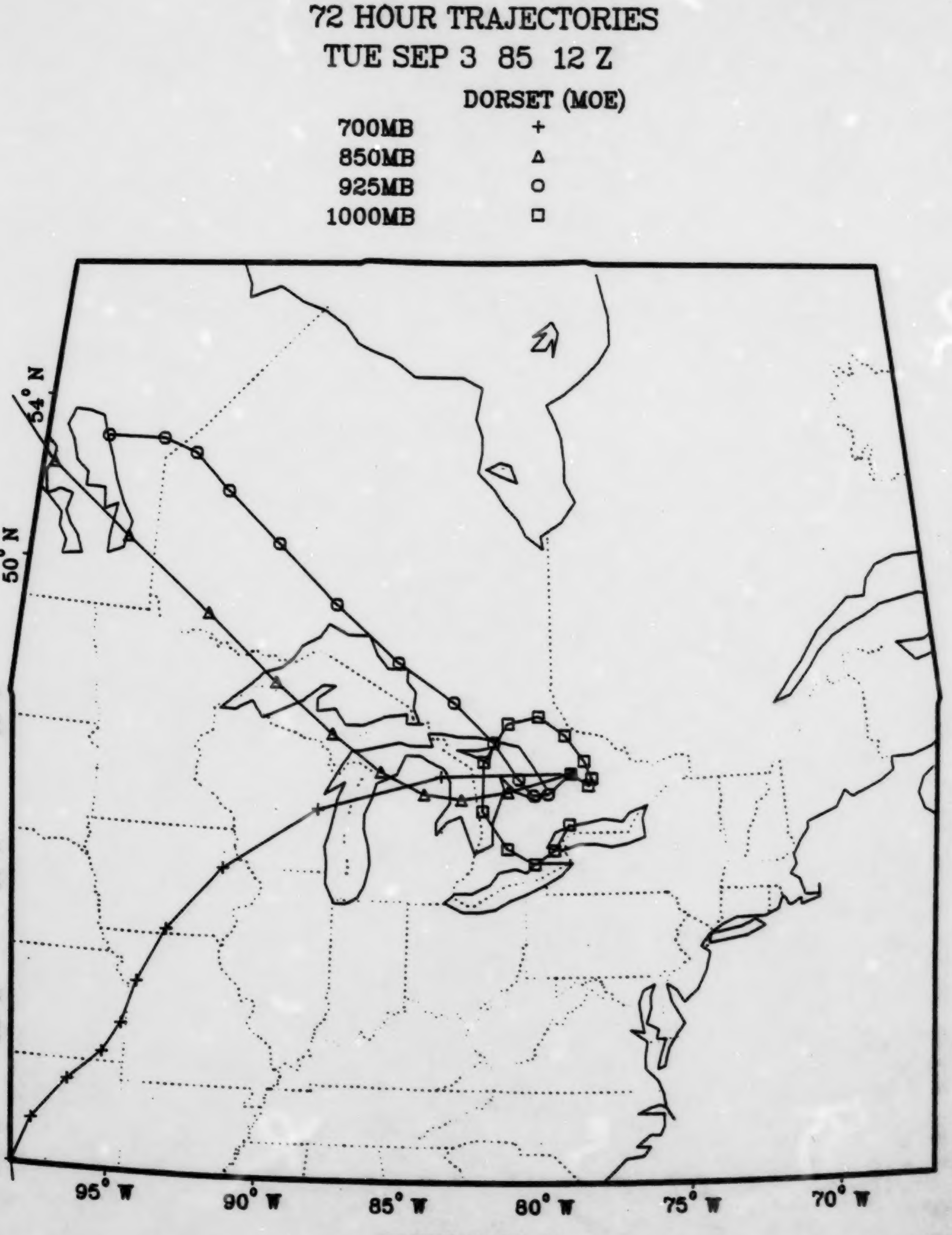

72 HOUR TRAJECTORIES
TUE SEP 3 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.21.4

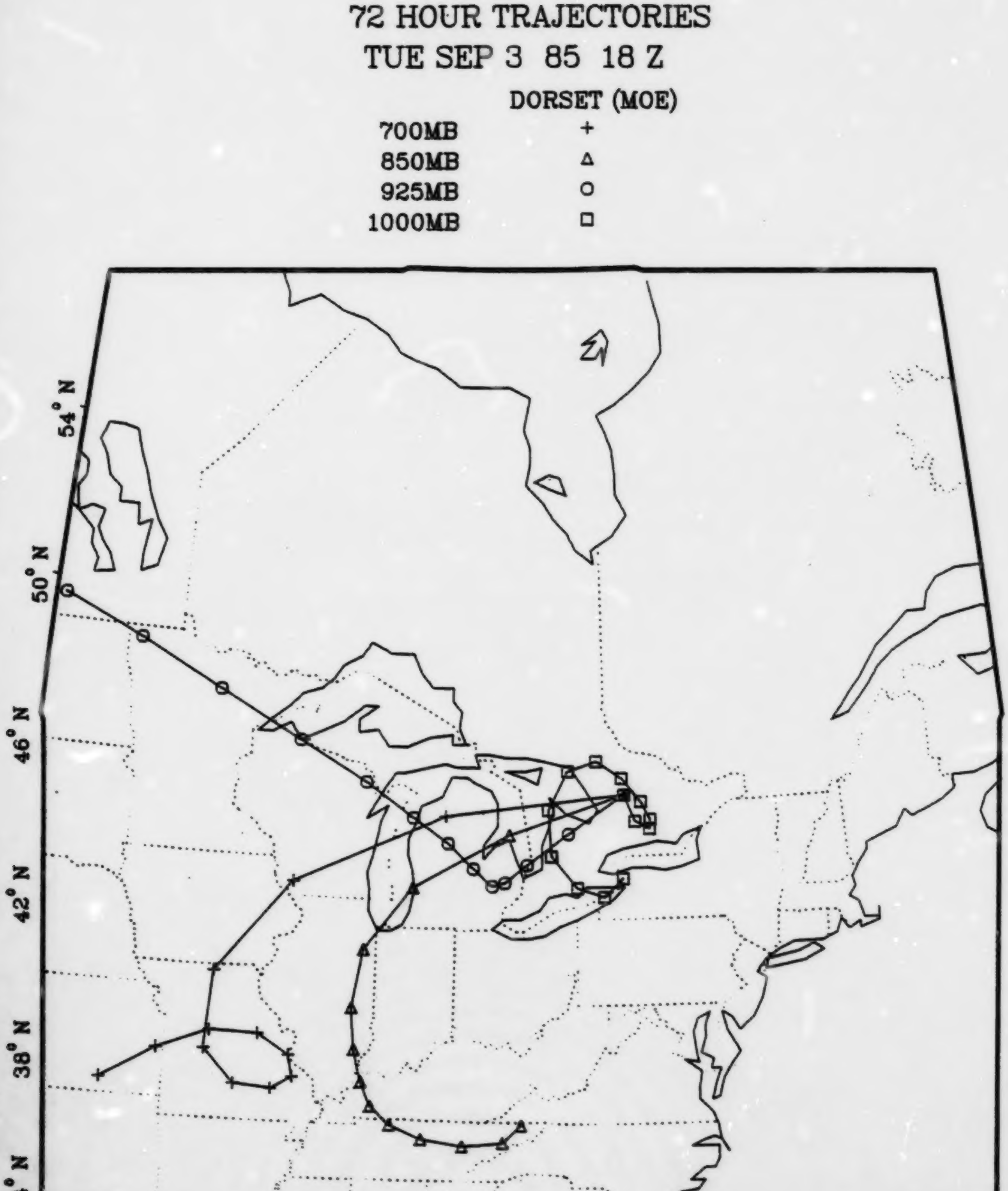

72 HOUR TRAJECTORIES
TUE SEP 3 85 18 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.21.5

72 HOUR TRAJECTORIES
WED SEP 4 85 0 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

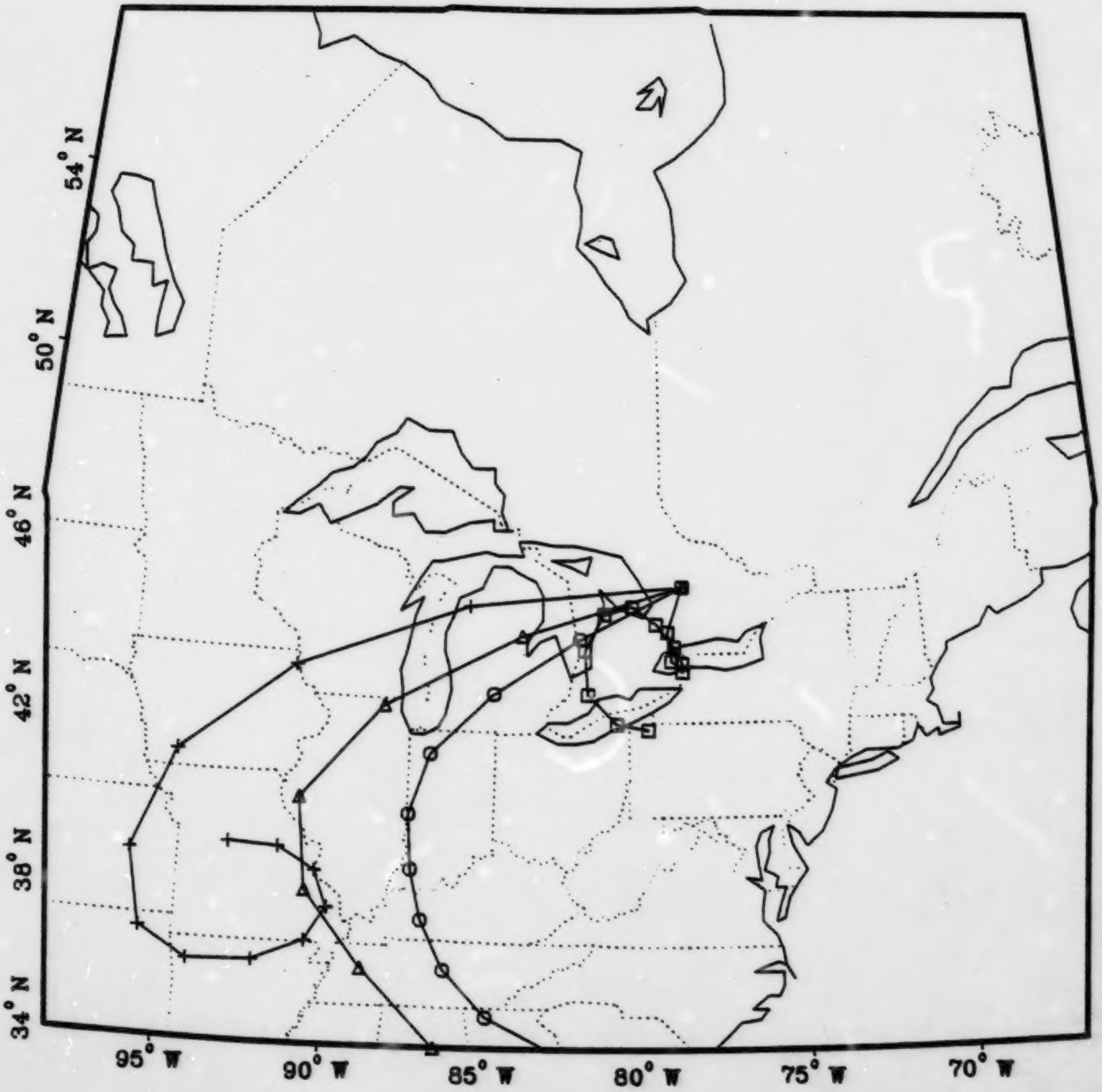
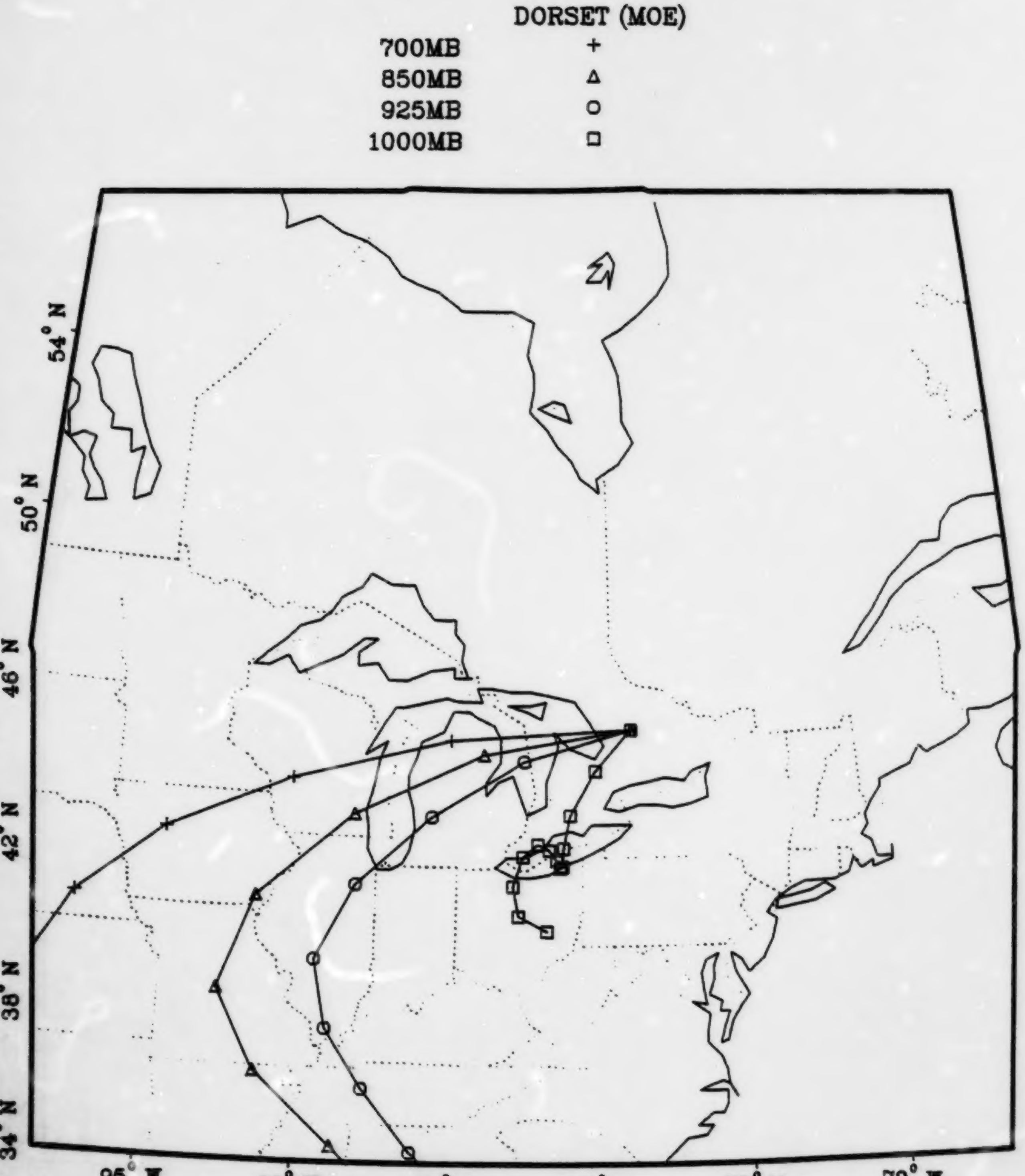

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.21.6



72 HOUR TRAJECTORIES
WED SEP 4 85 6 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.21.7

72 HOUR TRAJECTORIES
WED SEP 4 85 12 Z

	DORSET (MOE)
700MB	+
850MB	Δ
925MB	○
1000MB	□

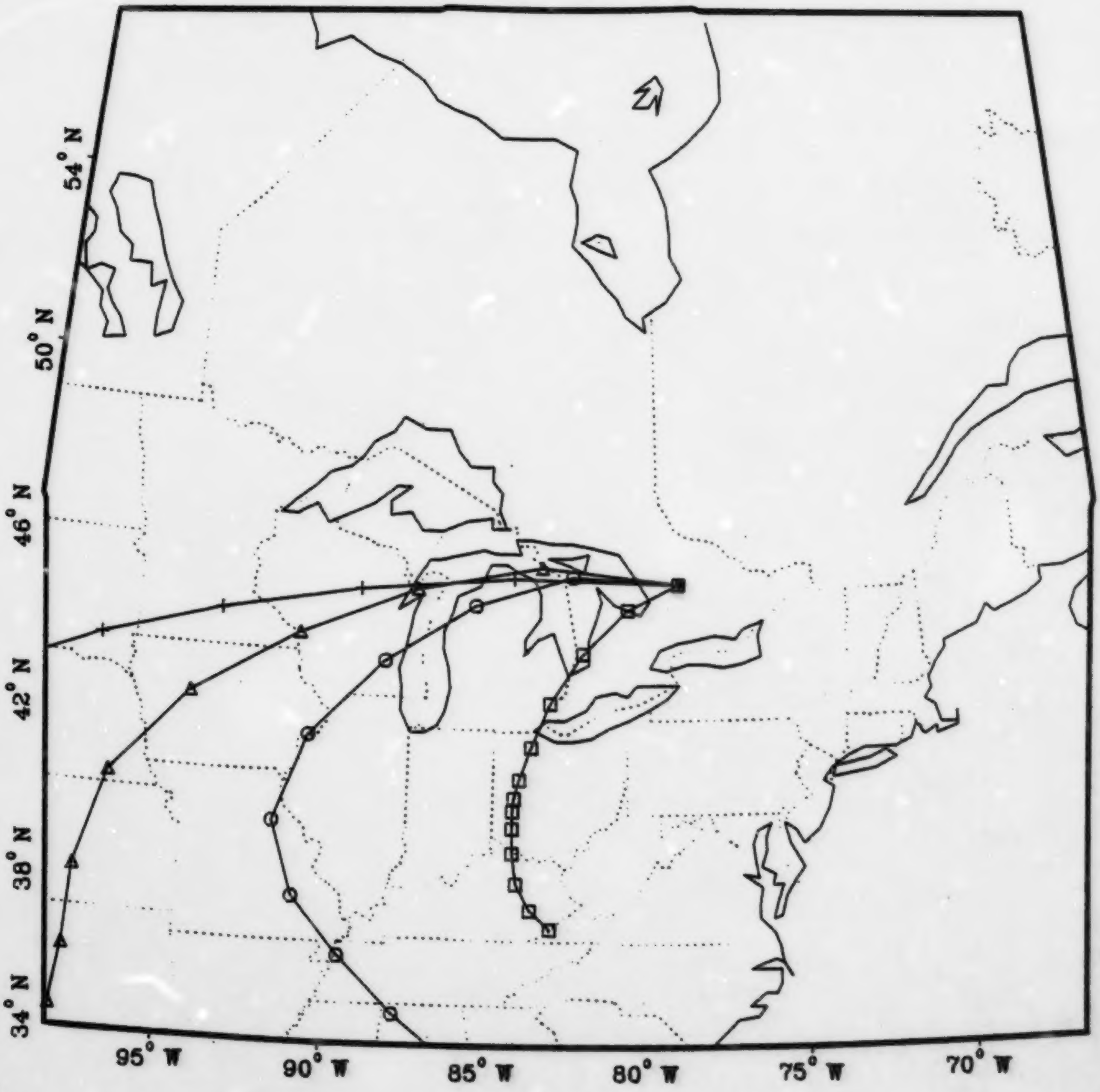
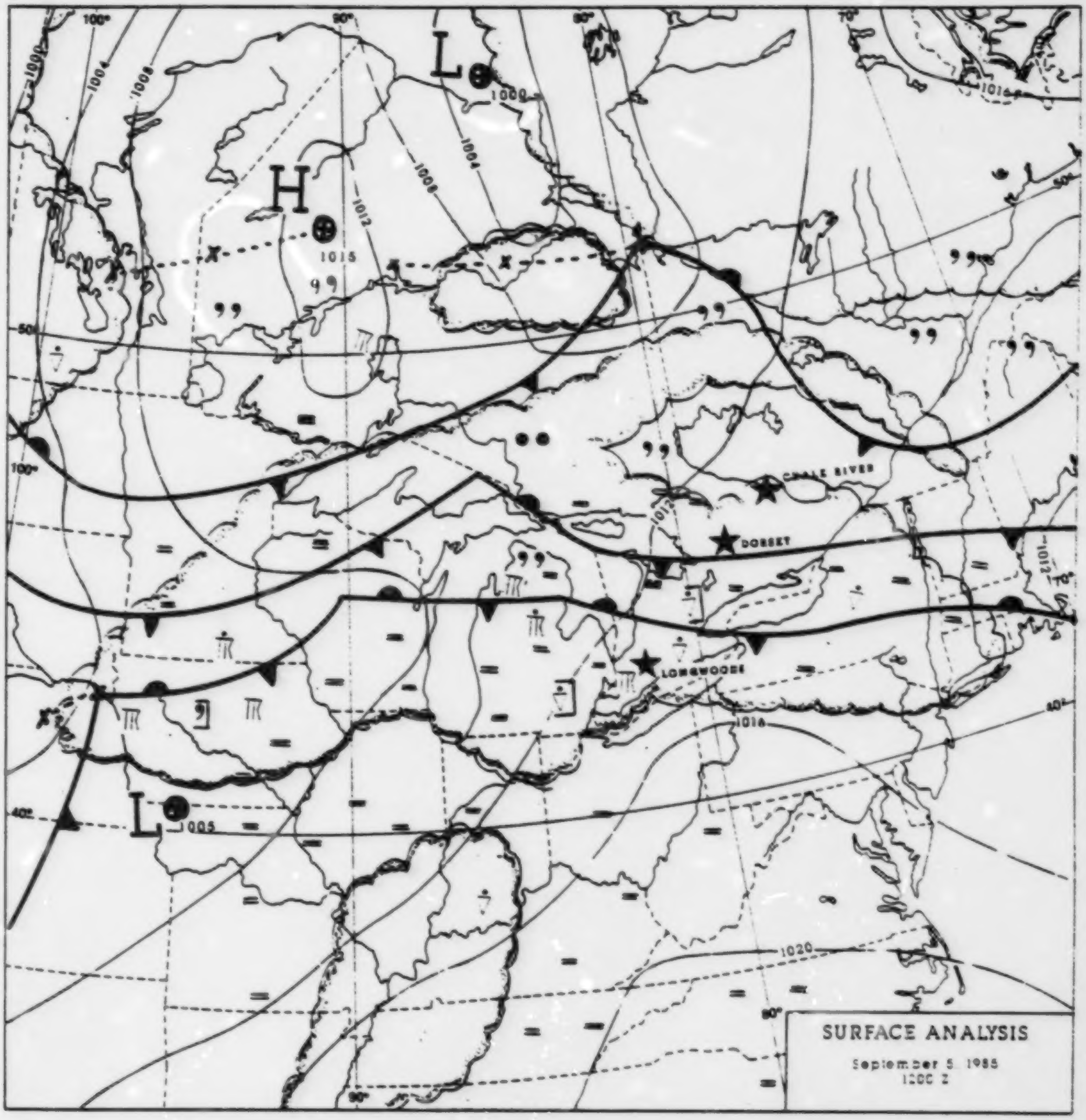

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.21.8

1.22 September 5-6, 1985, Longwoods(MOE)

This episode ranked last (8/8) and 6th (6/10) in the $SO_4^=$ and NO_3^- wet deposition events, respectively.
A wave over Michigan and stationary front over Lake Huron - Hamilton area on September 5, at 12Z as shown in Fig. 1.22.1, was observed. For the next 24 hours, a front lingered on north of Longwoods and on September 6, at 12Z it laid as shown in Fig. 1.22.2. This yielded unstable condition which coupled with the warm moist air from the southwest gave rise to showery precipitation at London on September 6 morning for about five hours as shown in Fig. 1.22.3. Lightning was observed and showers and thundershowers of light, moderate and heavy intensities were recorded. Rain showers of very light intensity for a very short duration (<1 hr) were also observed on Sept. 5, at about 20Z.
The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for September 5, at 12Z, 18Z and September 6, at 00Z, 06Z and 12Z are shown in Figures 1.22.4, 1.22.5, 1.22.6, 1.22.7 and 1.22.8 respectively.
Air trajectories for the 1000 mb level show that SO_2 from its highest emission and NO_x from its high emission Detroit area could have been transported on September 5, at 12Z, as shown in Fig. 1.22.4.
Air parcels arriving at the 925 mb level could have carried SO_2 and NO_x from their respective highest and high emission Detroit area from September 5, 18Z to September 6, 06Z (see Figs. 1.22.5-7).
Air trajectories for the 850 mb level show that SO_2 from the highest emission Chicago area on Sept. 6, at 12Z, as shown in Fig. 1.22.8, and other area in Illinois during 00Z-06Z as exhibited in Figs. 1.22.6-7, and NO_x from its highest emission Chicago area(Fig. 1.22.8) could have been transported.
Air trajectories for the 700 mb level show that SO_2 from the highest emission Chicago, on September 6 during 00Z-06Z as shown in Figs. 1.22.6-7, and other area in Illinois on Sept. 5, at 12Z as illustrated in Figs. 1.22.4, and NO_x from its highest emission Chicago area (Figs. 1.22.6-7) could have been transported.
Summarizing, a front lingered on in the area north of the station giving rise to rain showers and thundershowers of light, moderate and heavy intensities. Low level transport (1000 mb & 925 mb) of SO_2 from its highest emission Detroit area, and high level transport (850 mb & 700 mb) of SO_2 and NO_x from their highest emission Chicago area and of SO_2 from other area in Illinois was quite likely during this episode. It is notable that the low and high level transports were from different source regions during this episode.


100°
90°
80°
70°
50°
40°
L
H
1000
1004
1008
1012
1015
1016
1020
1005
CHALK RIVER
DORSET
LONGWOODS

SURFACE ANALYSIS

September 5, 1985
1200 Z

FIGURE 1.22.1

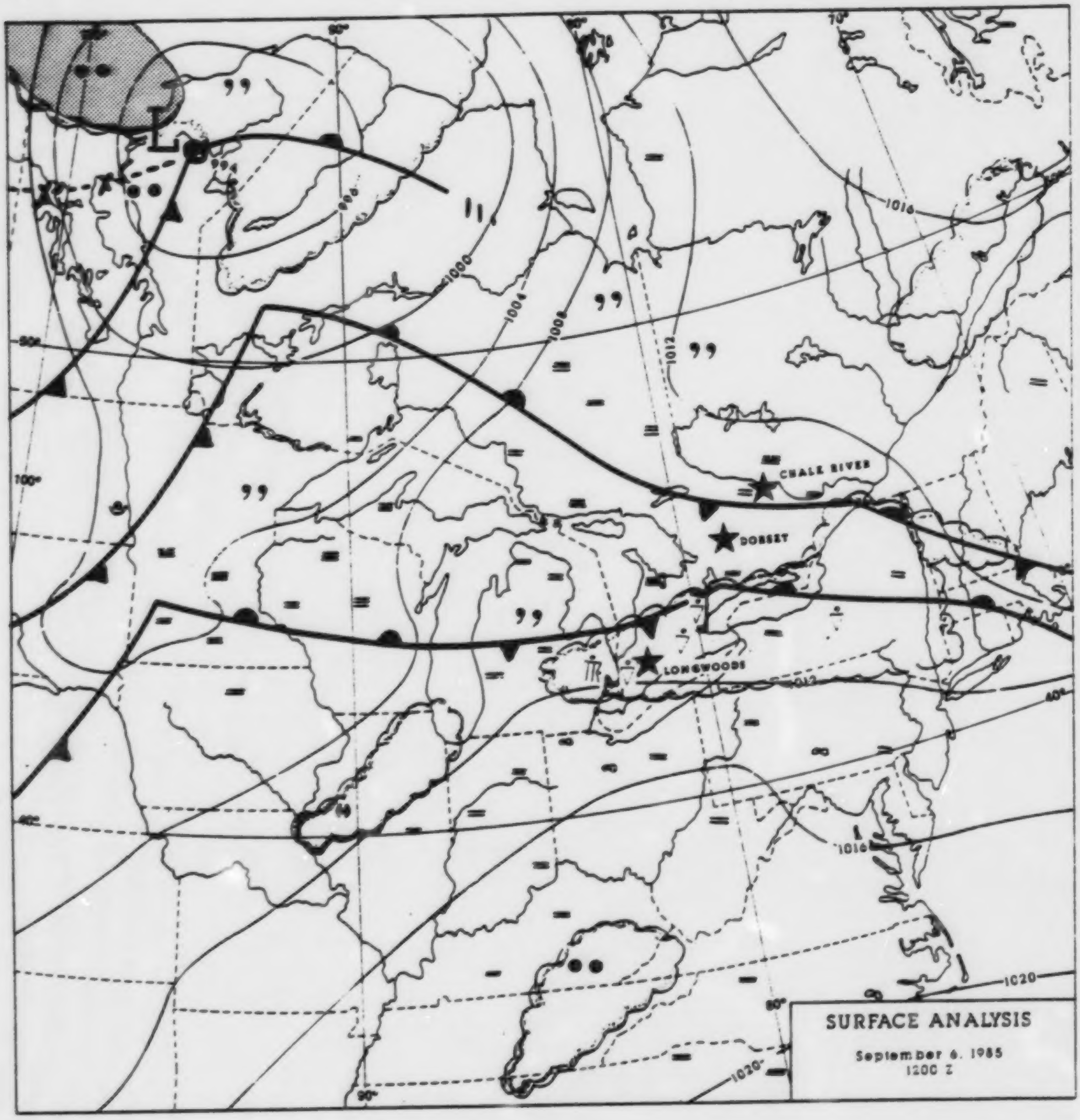
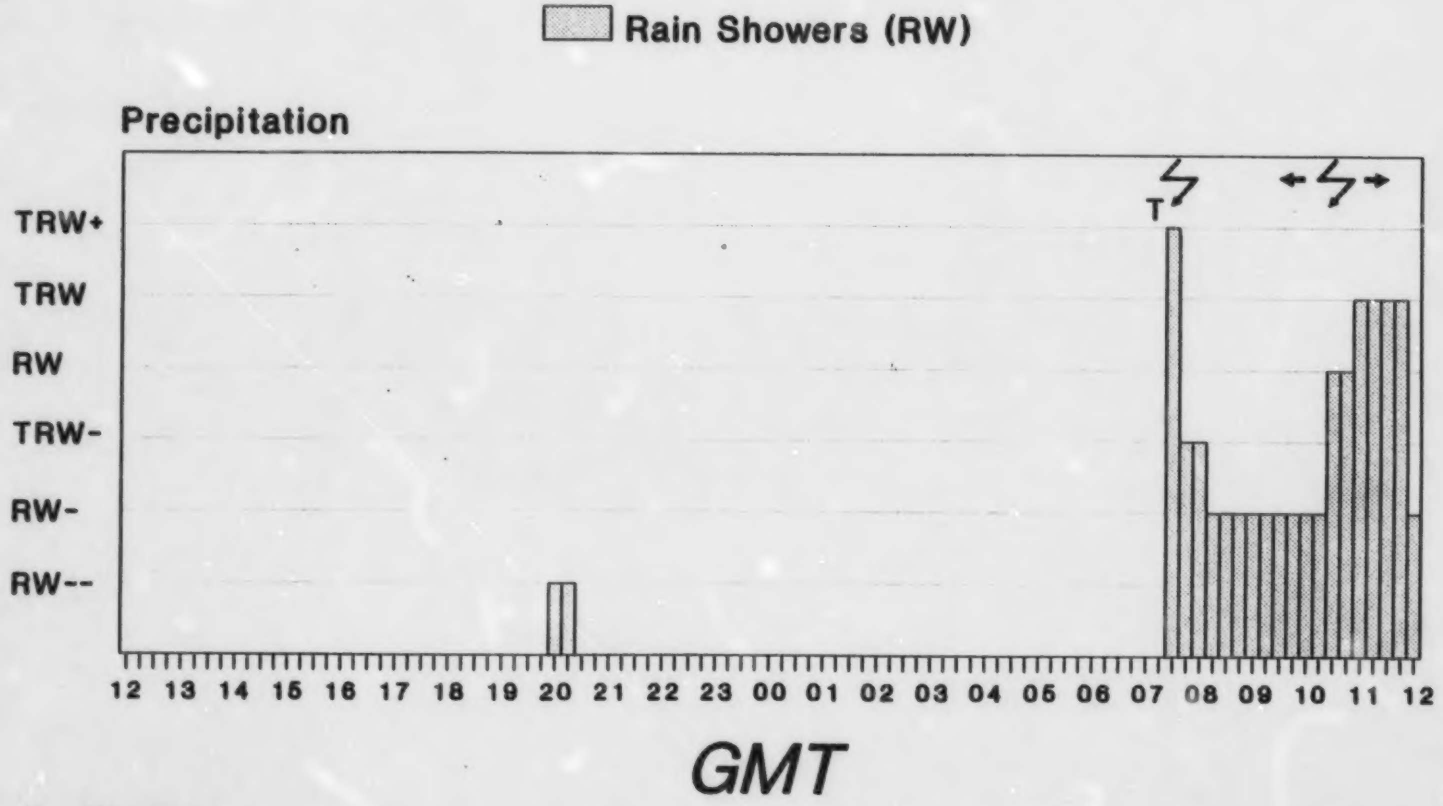

SURFACE ANALYSIS
September 6, 1985
1200 Z
L
CHALK RIVER
DORSET
LONGWOODS
996
1000
1004
1008
1012
1016
1020
90°
80°
70°
50°
100°
40°

FIGURE 1.22.2

London A
Sep. 5-6, 1985



T - Thunder

FIGURE 1.22.3

72 HOUR TRAJECTORIES
THU SEP 5 85 12 Z

	LONGWOODS (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

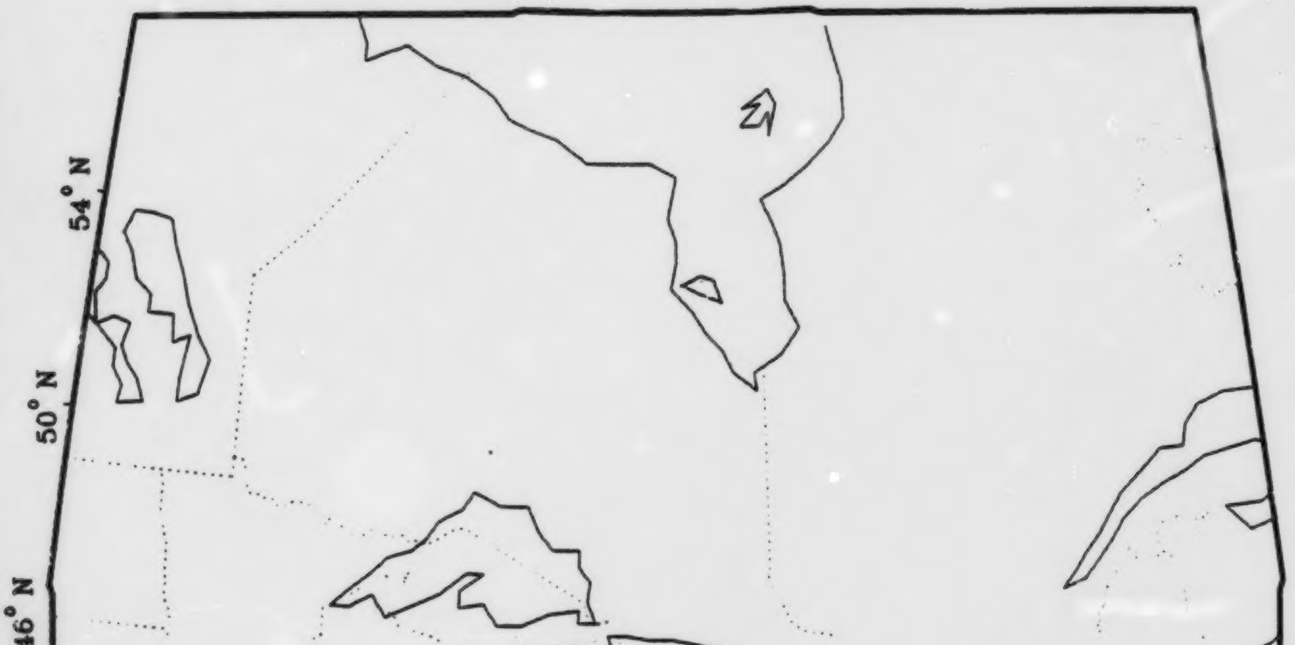
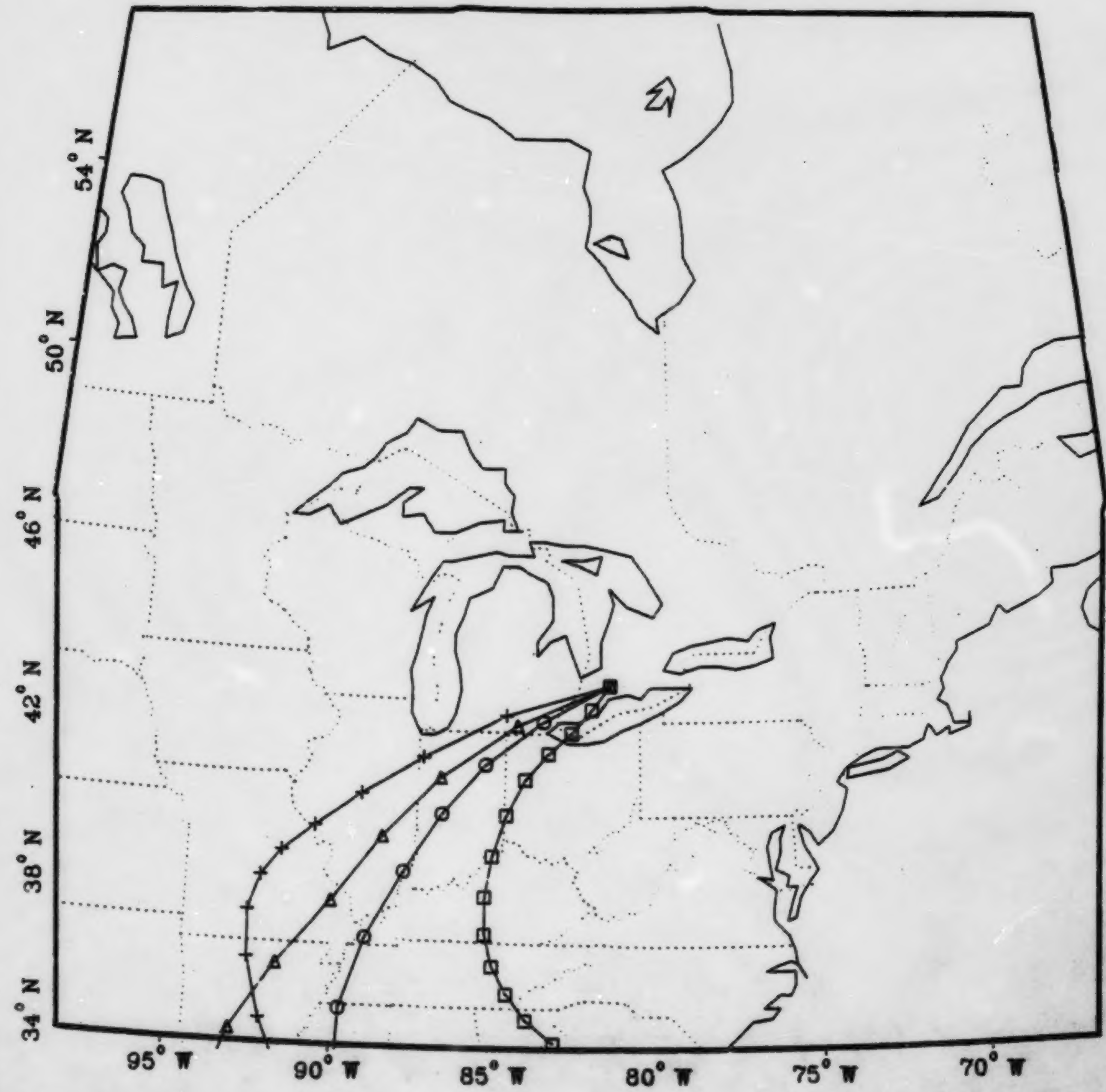

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.22.4

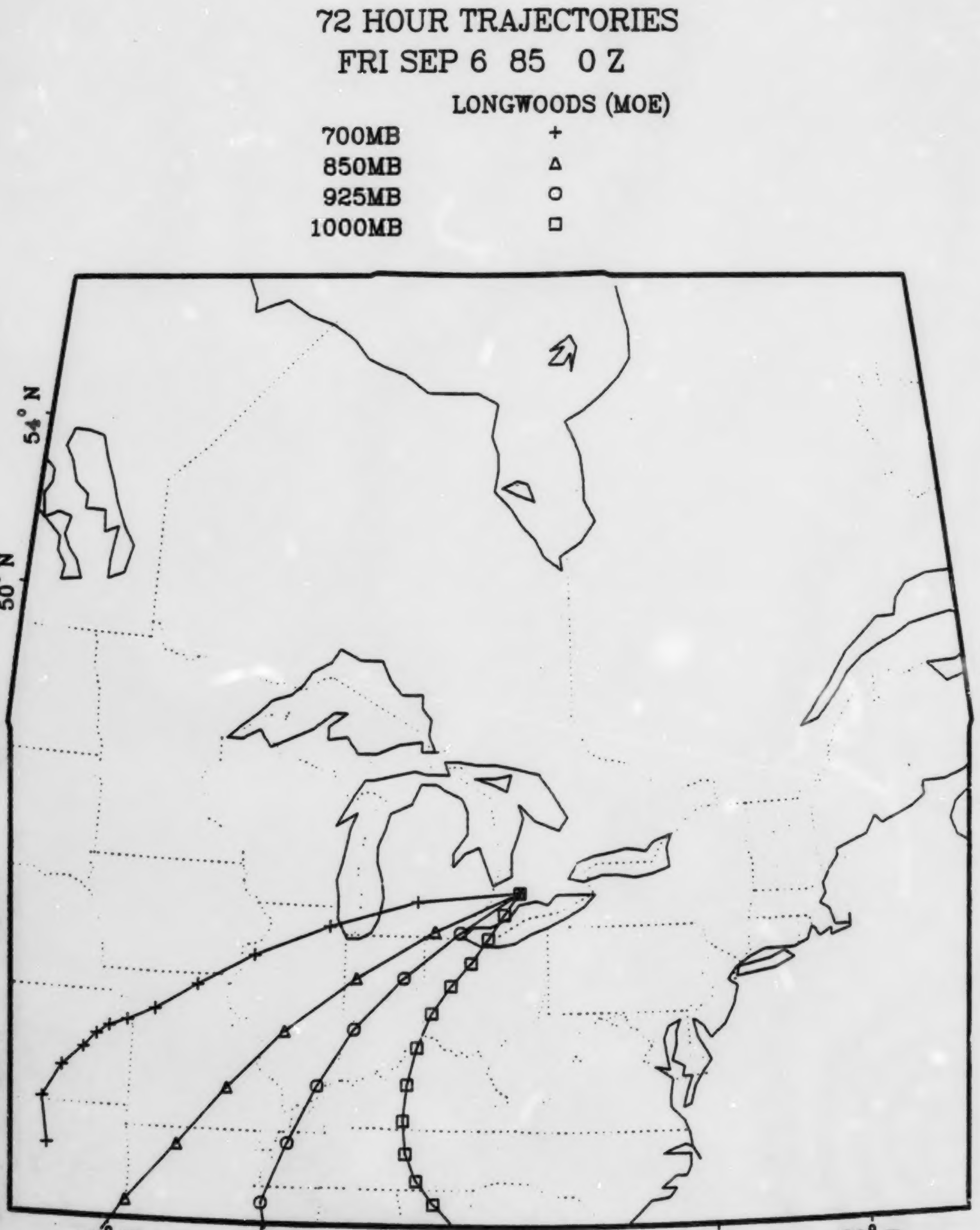
72 HOUR TRAJECTORIES
THU SEP 5 85 18 Z

	LONGWOODS (MOE)
700MB	+
850MB	Δ
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.22.5


72 HOUR TRAJECTORIES
FRI SEP 6 85 0 Z

LONGWOODS (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.22.6

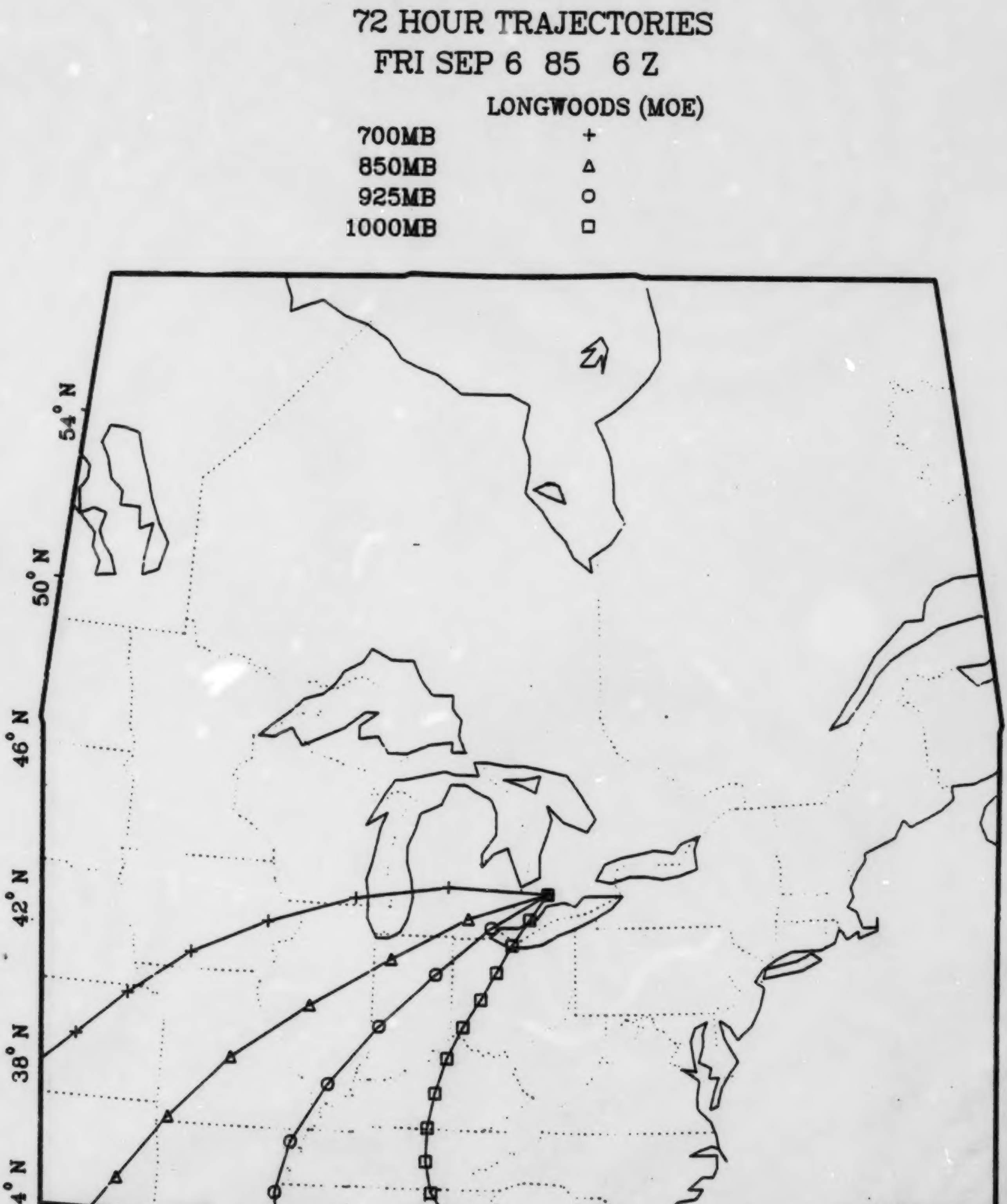

72 HOUR TRAJECTORIES
FRI SEP 6 85 6 Z
LONGWOODS (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.22.7

72 HOUR TRAJECTORIES
FRI SEP 6 85 12 Z

	LONGWOODS (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

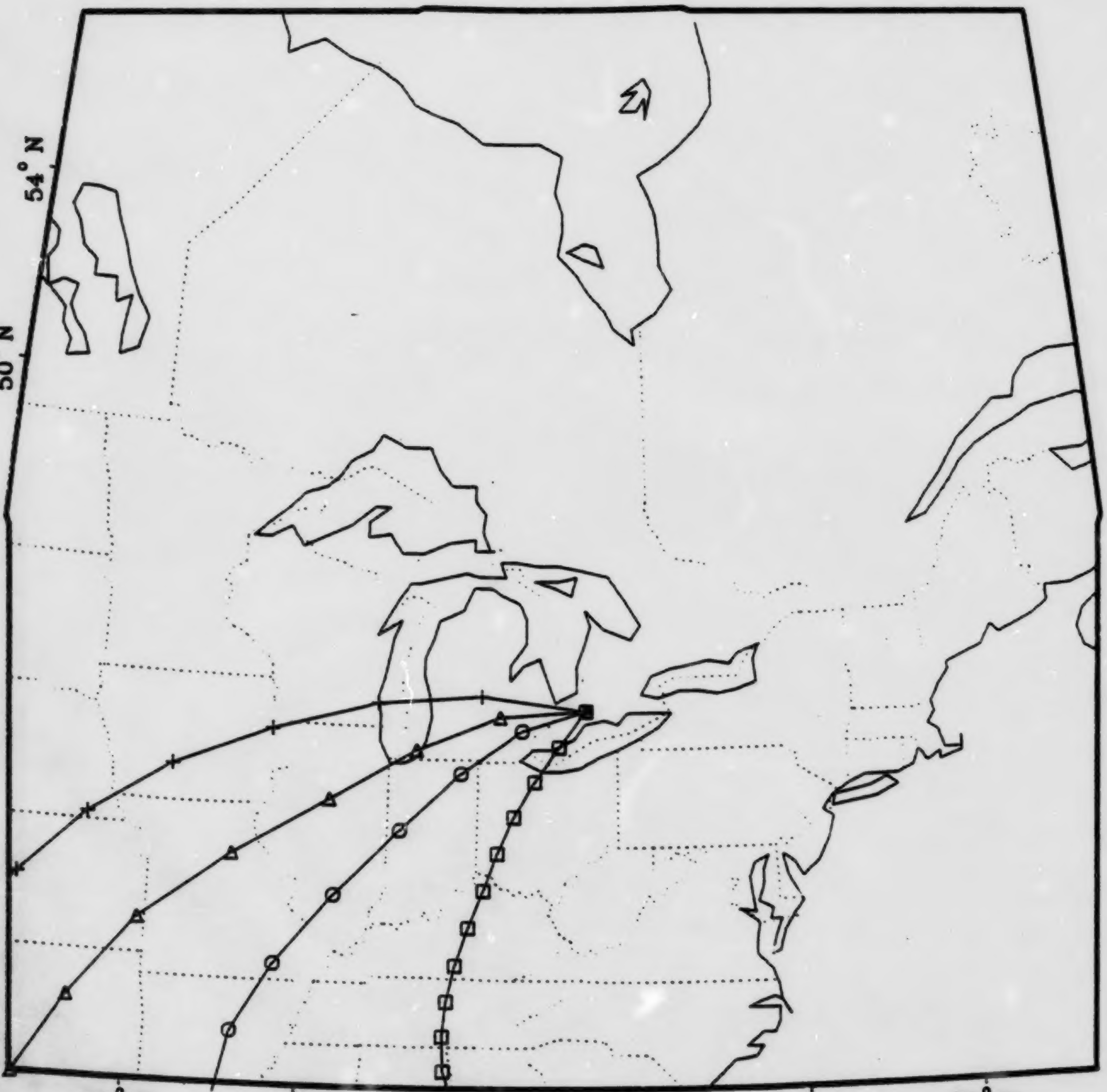

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.22.8

1.23 September 7-8, 1985, Longwoods(AES & MOE)

This is the highest ranking episode for the $SO_4^=$ (1/8) and the second highest for the NO_3^- (2/10) wet deposition for both Longwoods stations. A wave near Muskoka with the cold front in an east-west direction over Lake Huron and the warm front in a southeast direction was observed on September 7, at 12Z, as shown in Fig. 1.23.1, affecting the weather in the southwest Ontario. During the next 24 hours, frontal systems hovered around Lake Huron north of the station. On September 8, at 12Z, as exhibited in Fig. 1.23.2, a cold front in a southwest direction over Lake Huron with the wave near Goderich and the warm front extending to Toronto was observed. This gave rise to rain showers and thundershowers as shown in Fig. 1.23.3. As shown in this figure two thunderstorms with moderate to heavy intensity occurred and lightning was observed for a few hours.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for September 7, at 12Z, 18Z and September 8, at 00Z, 06Z and 12Z are shown in Figures 1.23.4, 1.23.5, 1.23.6, 1.23.7 and 1.23.8 respectively.

Air trajectories for the 1000 mb level show that SO_2 from its highest and NO_x from its high emission Detroit area could have been transported for most of the duration of this episode as illustrated in Figs. 1.23.4-8.

Air parcels arriving at the 925 mb level could have carried SO_2 and NO_x from their highest emission Chicago area as well as SO_2 from the other area in Illinois throughout the entire duration of this episode, as shown in Figs. 1.23.4-8.

Air trajectories for the 850 mb level show that SO_2 and NO_x from the highest emission Chicago area could have been transported for the entire duration of this episode, as illustrated in Figs. 1.23.4-8.

Air parcels arriving at the 700 mb level could have carried SO_2 and NO_x from their highest emission Chicago area on September 8, during 06Z-12Z, as shown in Figs. 1.23.7-8. The transport of SO_2 from the other highest emission area in Illinois was also possible for a few hours on September 8 (see Fig. 1.23.8).

Summarizing, a presence of the frontal systems to the north of the station for the entire duration of this episode yielded convective precipitation. Rain showers and thundershowers from very light to heavy intensities were recorded and lightnings were observed for a few hours . Transport of SO_2 and NO_x at low (925 mb) and high (850 mb & 700 mb) levels from the Chicago, and other area in Illinois and of SO_2 at low level (1000 mb) from Detroit area occurred for most of the period during this episode.

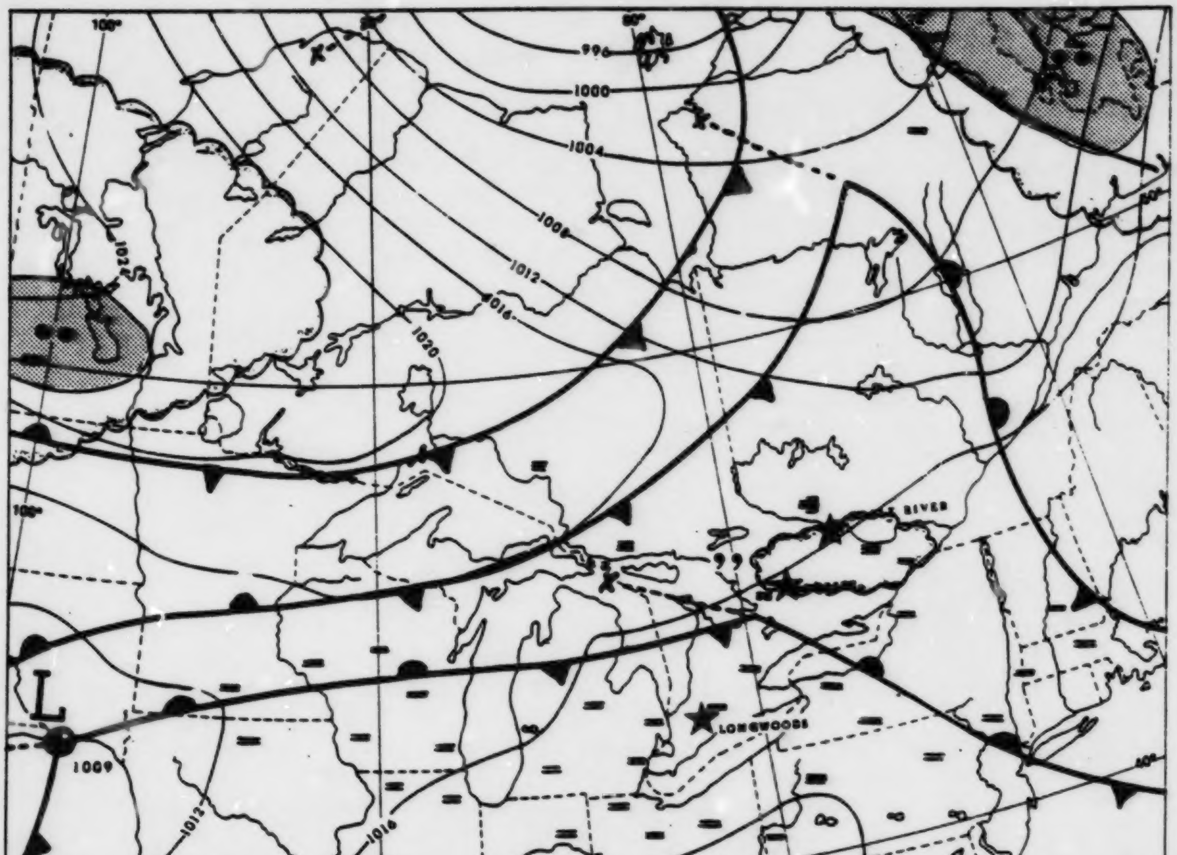

SURFACE ANALYSIS
September 7, 1985
1200 Z
996
1000
1004
1008
1012
1016
1020
1024
1009
L
H
LONGWOODS
RIVER
100°
90°
80°
40°

FIGURE 1.23.1

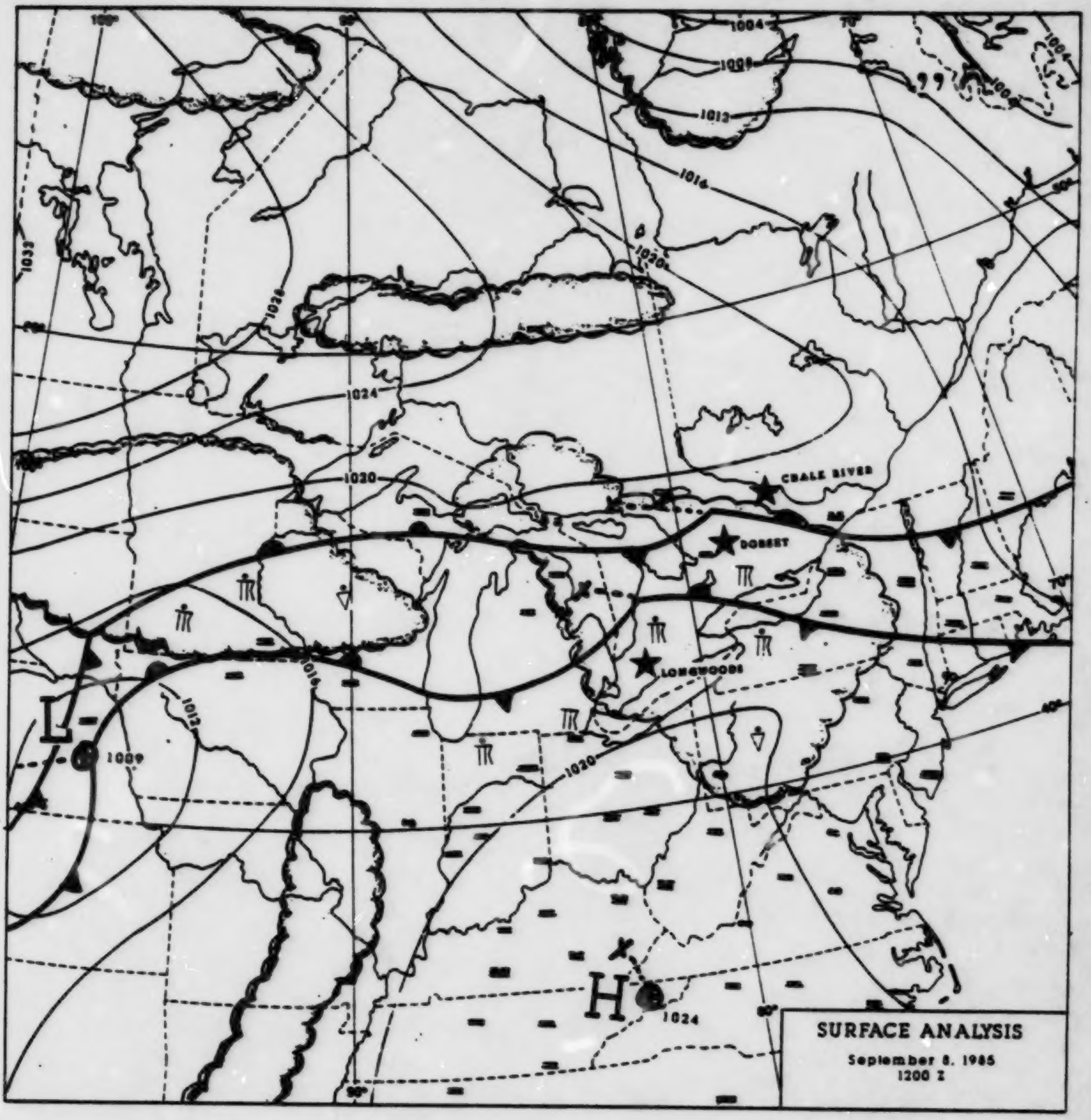
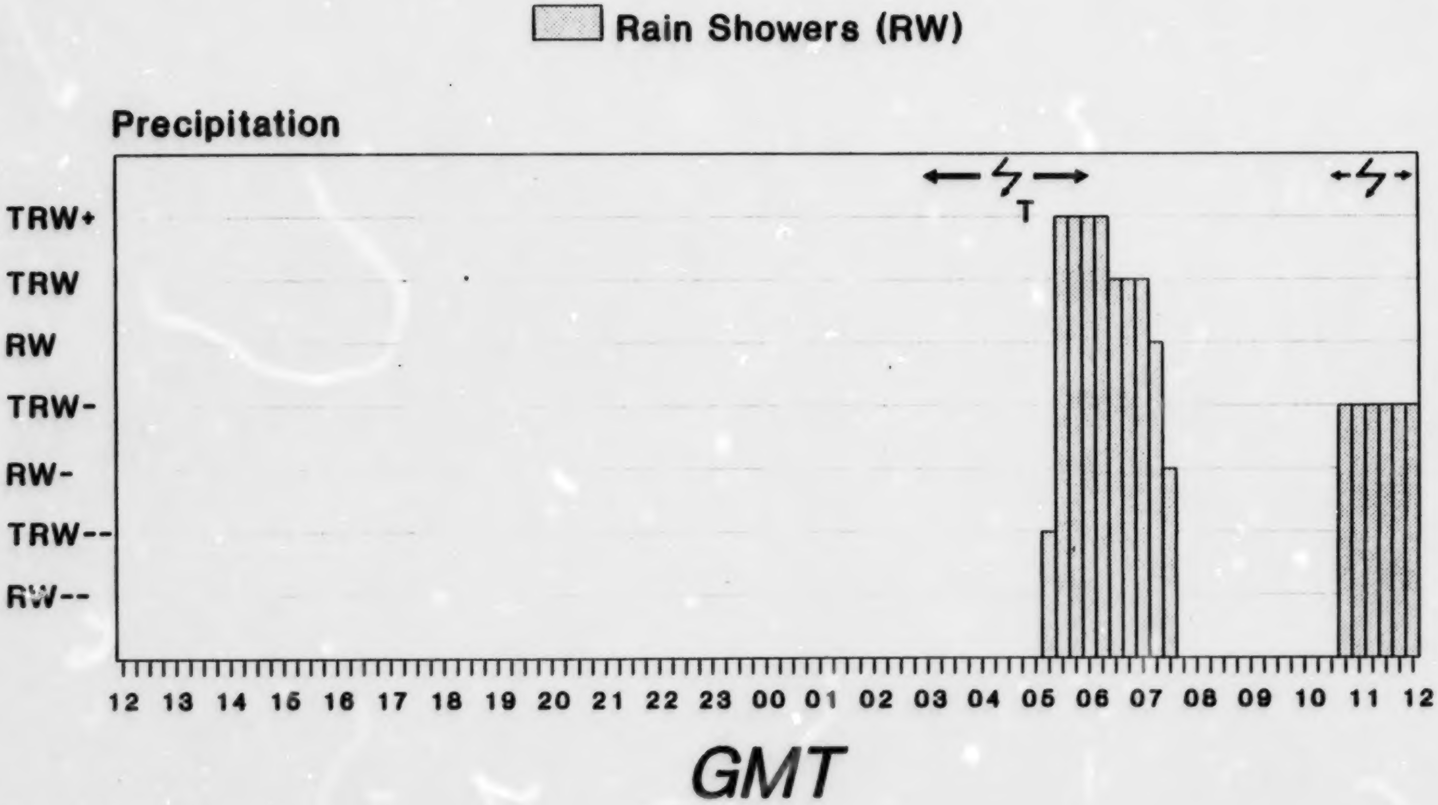

SURFACE ANALYSIS
September 8, 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
L
H
1004
1008
1012
1016
1020
1024
1028
1032
1009
100°
90°
80°
70°
60°
50°
40°

FIGURE 1.23.2

London A

Sep. 7-8, 1985



T - Thunder

FIGURE 1.23.3

72 HOUR TRAJECTORIES
SAT SEP 7 85 12 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

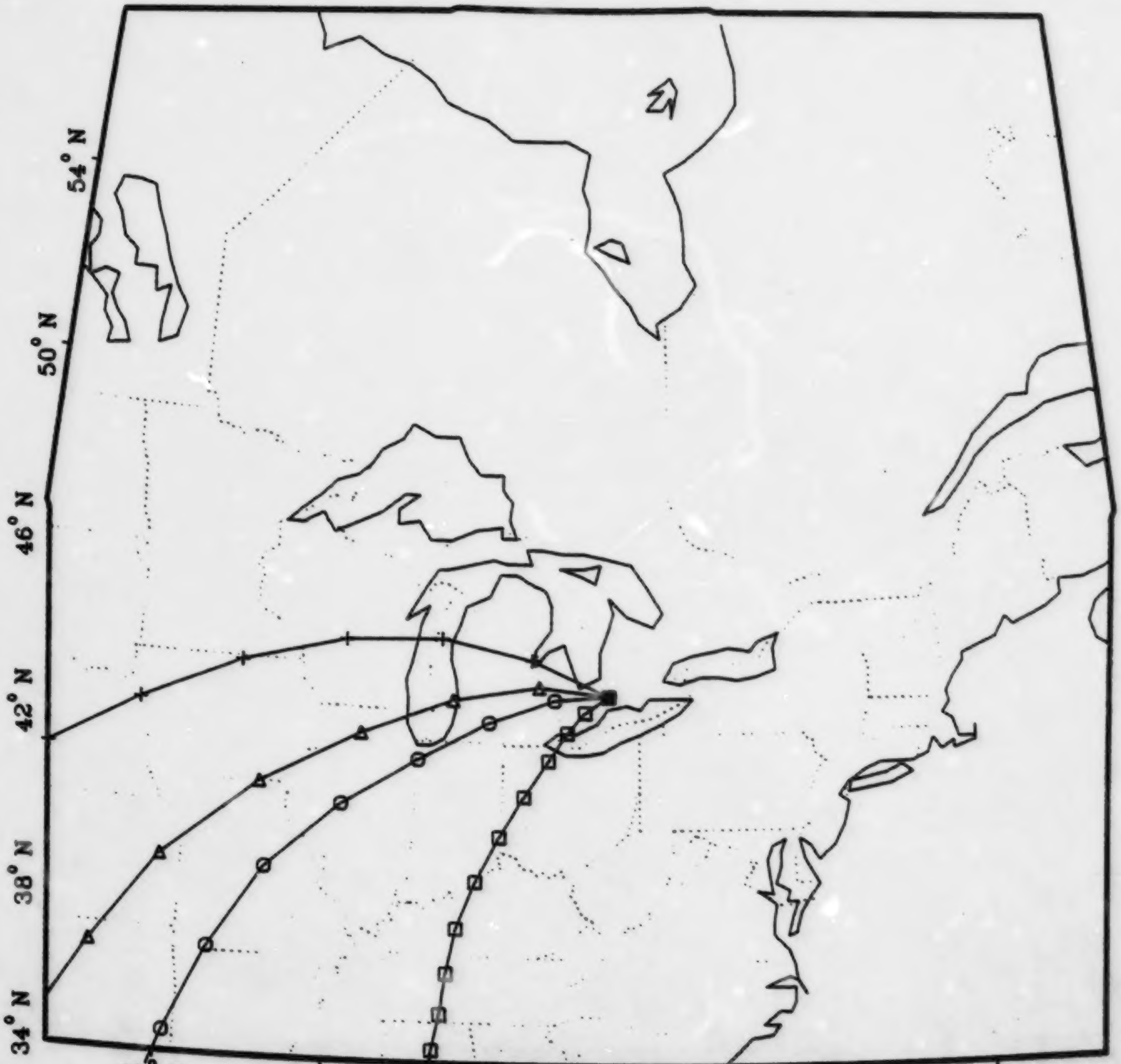

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.23.4

72 HOUR TRAJECTORIES
SAT SEP 7 85 18 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

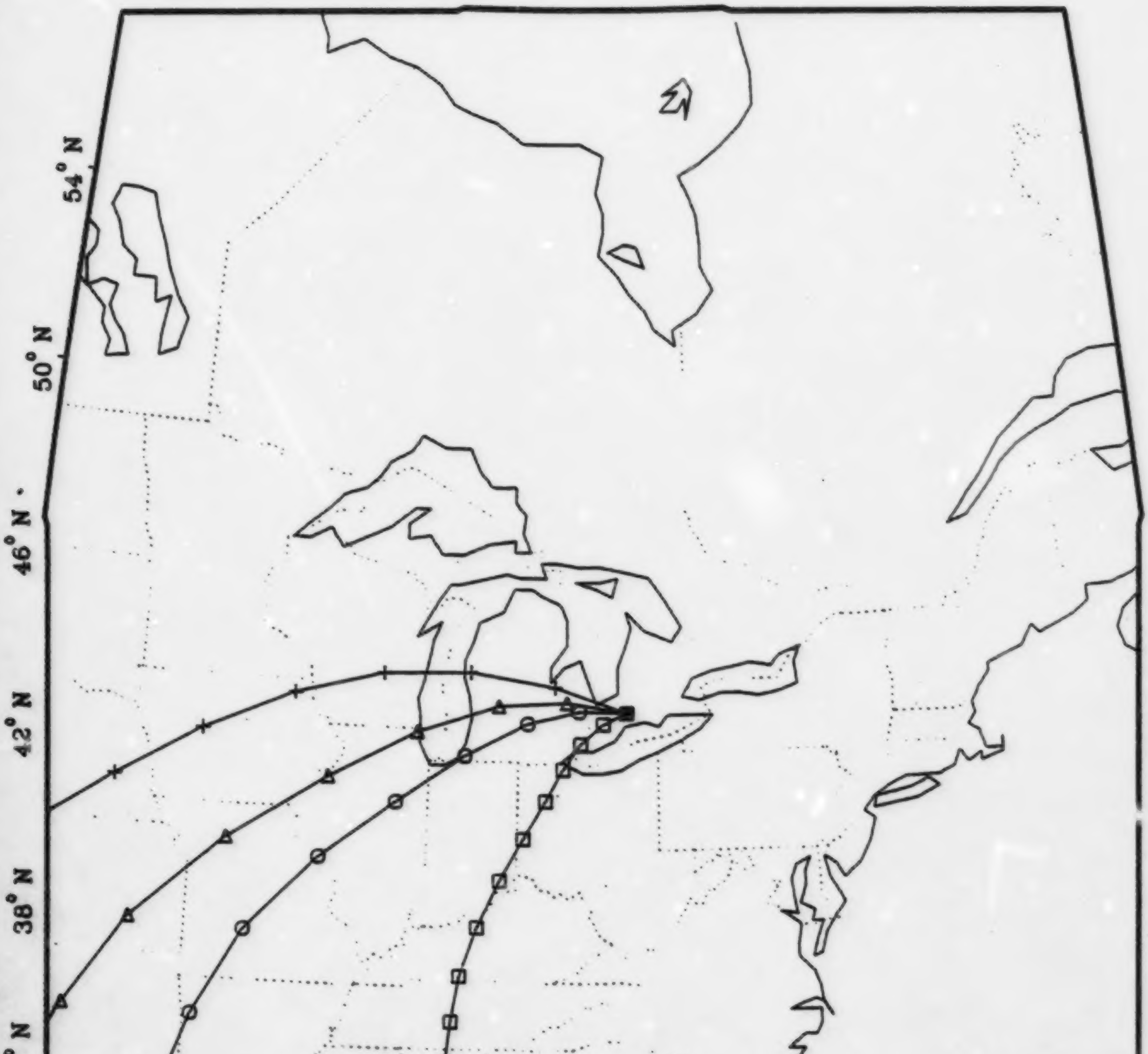

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.23.5

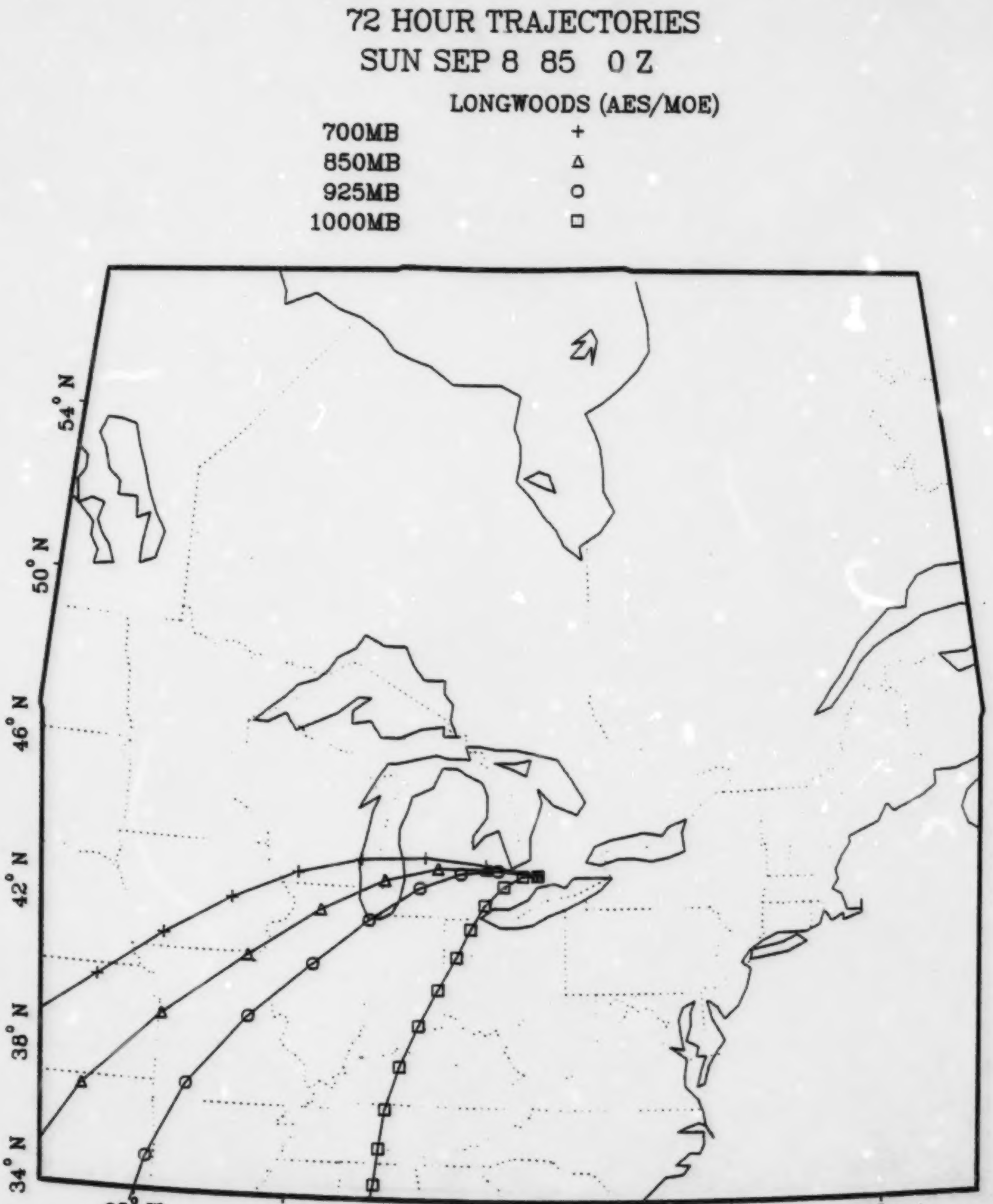

72 HOUR TRAJECTORIES
SUN SEP 8 85 0 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.23.6

72 HOUR TRAJECTORIES
SUN SEP 8 85 6 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

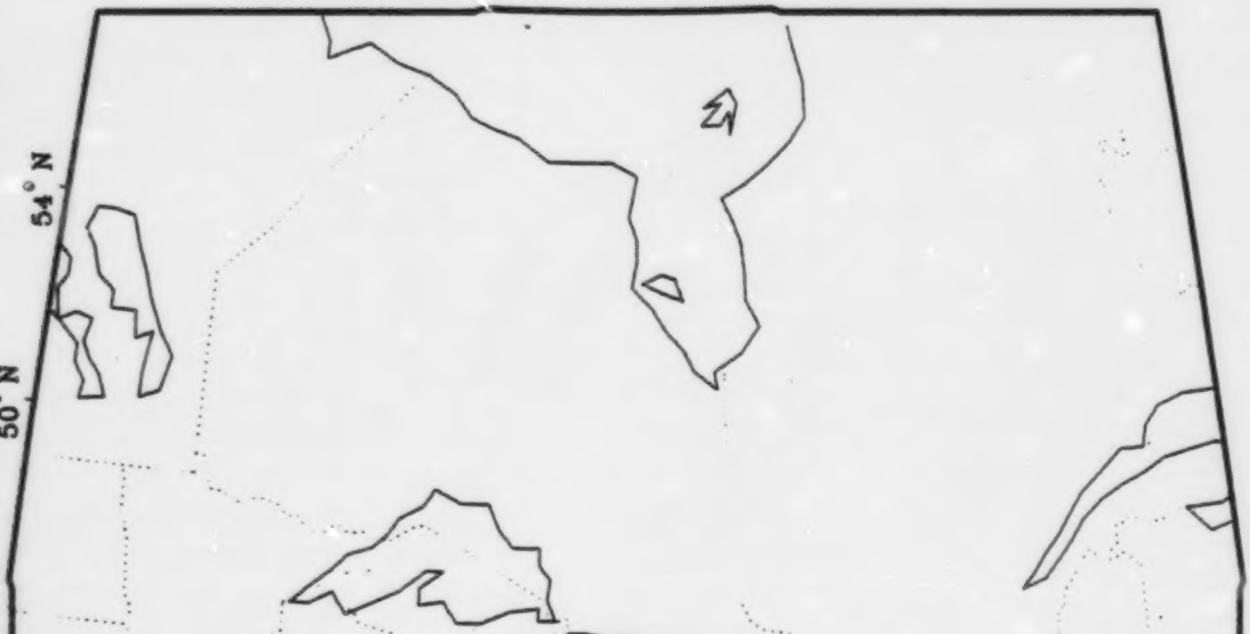
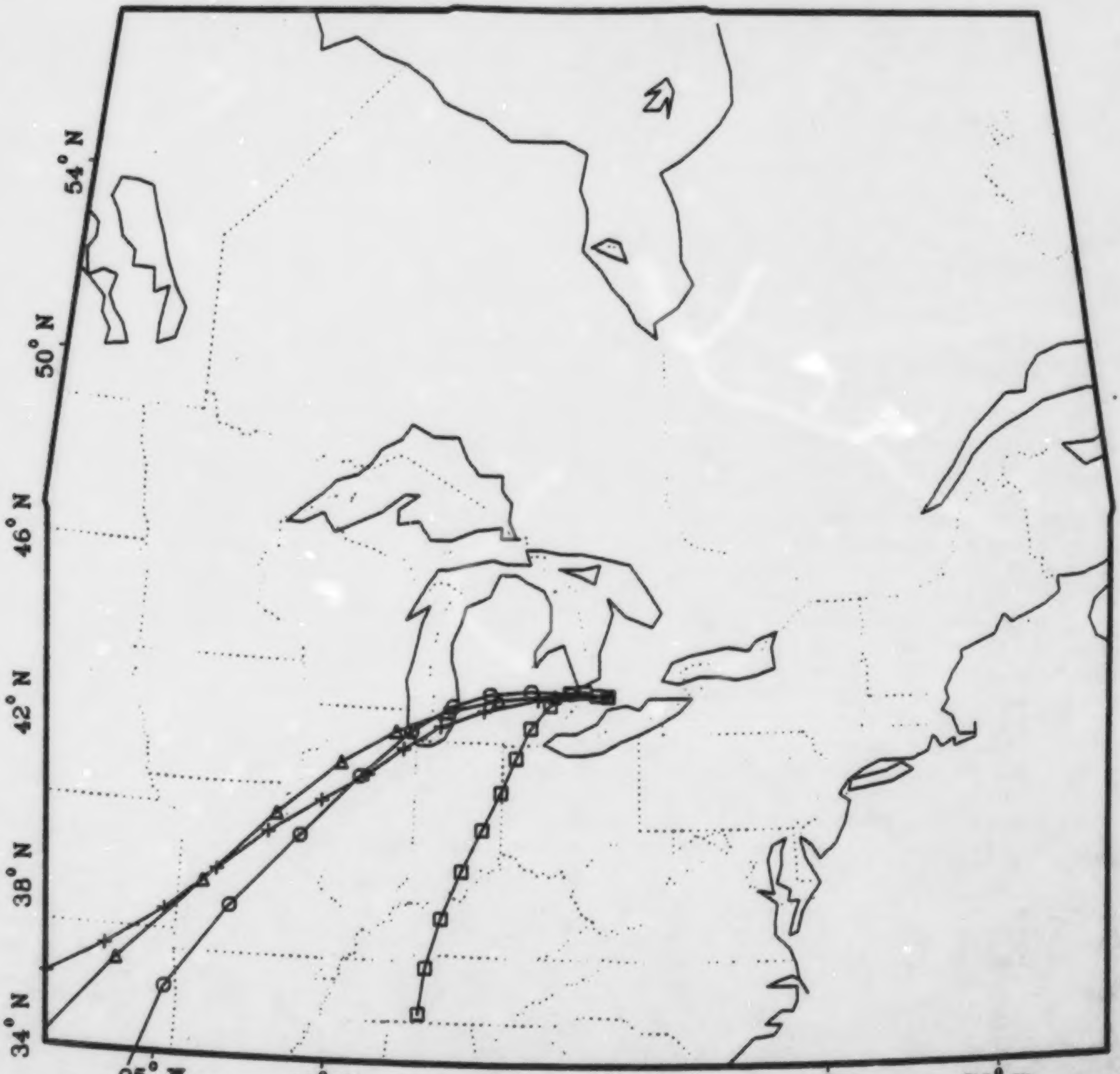

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.23.7

72 HOUR TRAJECTORIES
SUN SEP 8 85 12 Z

	LONGWOODS (AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.23.8

1.24 September 26-27, 1985, Chalk River

This episode at Chalk River was ranked the last 7th (7/7) for the NO_3^- deposition in the top 25% events.

A low pressure centre, 1006 mb, over Michigan near Lansing, was associated with a frontal system such that the warm front laid over Goderich - Toronto in Ontario on September 26, at 12Z, as shown in Fig. 1.24.1. The low filled as it moved in a NE direction and the warm front crossed over Chalk River by 00Z on September 27 and the station remained in the warm sector till 12Z when the cold front arrived over the station as shown in Fig. 1.24.2. The continuous precipitation band, as exhibited in Fig. 1.24.1, moved over the station on September morning and rain showers of very light, light and moderate intensities occurred for almost 12 hours and then changed to light rain as illustrated in Fig. 1.24.3. Drizzle of very light intensity occurred for a very short duration (<< 1 hr).
The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for September 26, at 12Z, 18Z and September 27, at 00Z, 06Z and 12Z are shown in Figures 1.24.4, 1.24.5, 1.24.6, 1.24.7 and 1.24.8 respectively.
Air trajectories for the 1000 mb level show that NO_x could not have been transported from any highest emission source region but could have been carried from the high Detroit area on Sept. 26, 18Z to Sept. 27, 06Z as shown in Figs. 1.24.5-7.
Air parcels arriving at the 925 mb level could have transported NO_x from the highest emission Chicago area on Sept. 27, 00Z-06Z as shown in Figs. 1.24.6-7.
Air trajectories for the 850 mb level show that no highest emission NO_x source area was involved in the pollution transport but it could have been carried over from high emission sources in Detroit area(Fig. 1.24.4), and Pennsylvania- Ohio- West Virginia areas as shown in Figs. 1.24.5-7.
Air parcels arriving at the 700 mb level show that the NO_x from the high emission Cleveland, Ohio area could have been transported at this level for some time as shown in Fig. 1.24.4.
In summary, a warm front and a continuous precipitation band crossed over the station yielding rain showers of very light to moderate intensities and light rain. the precipitation occurred for almost 16 hours during this episode. Transport of NO_x at low level (925 mb) from the highest emission Chicago area occurred for about six hours. NO_x from a number of high emission sources could also have been carried at low and high levels.

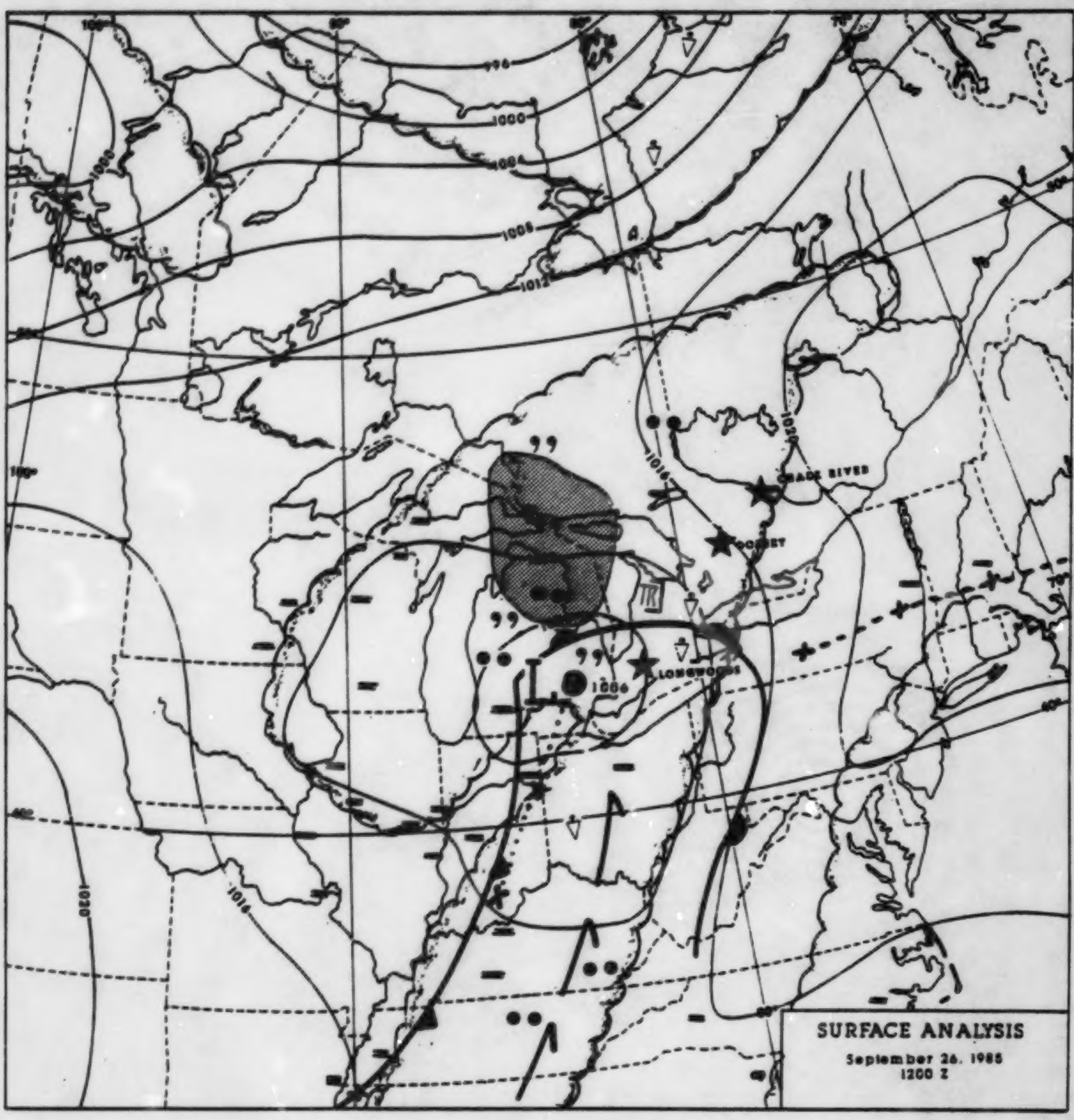

996
1000
1004
1008
1012
1016
1020
1006
L
CHALK RIVER
DORSET
LONGWOODS
SURFACE ANALYSIS
September 26, 1985
1200 Z

FIGURE 1.24.1

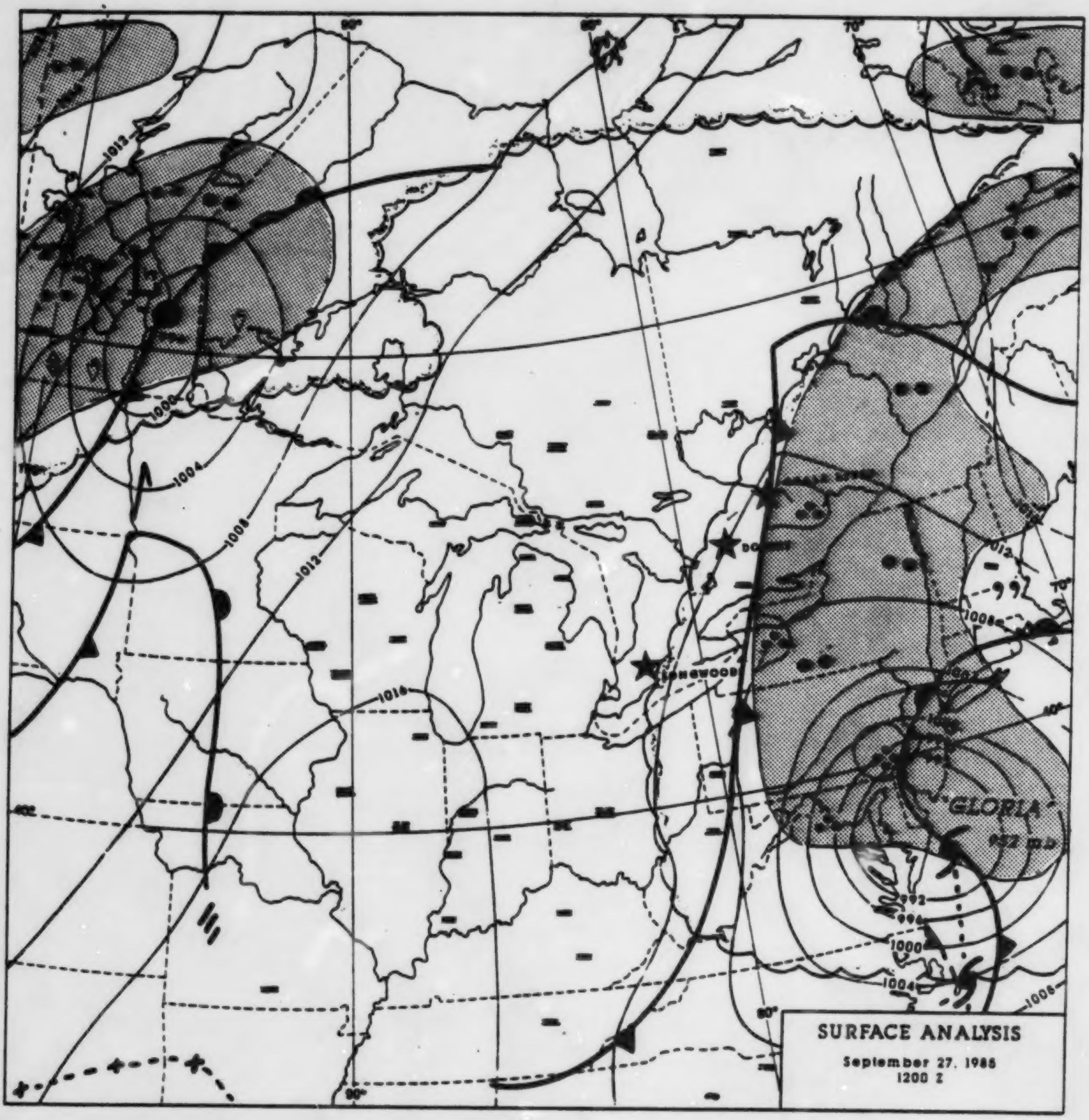
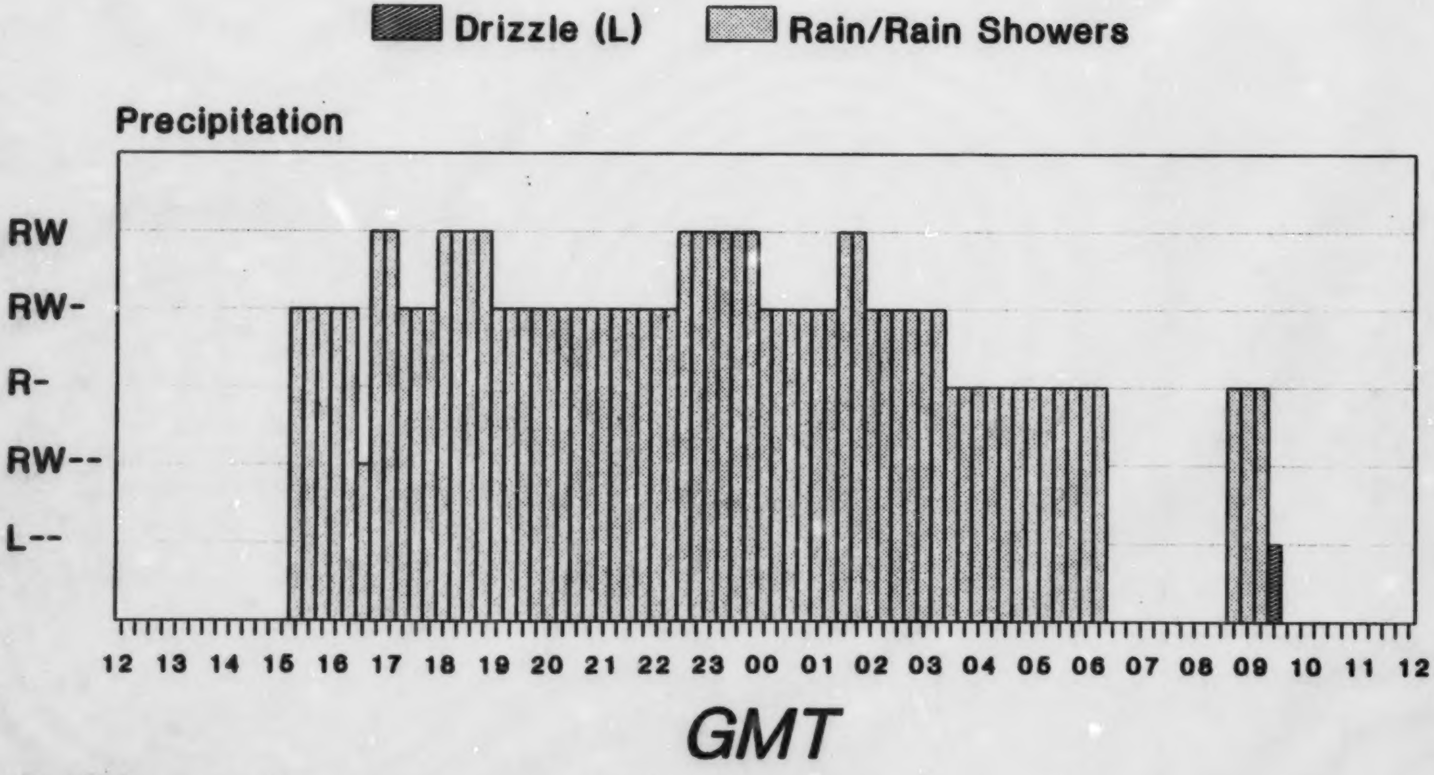

SURFACE ANALYSIS
September 27, 1985
1200 Z
"GLORIA"
952 mb
LONGWOOD
1012
1000
1004
1008
1012
1016
992
996
1000
1004
1008
90°
80°
70°

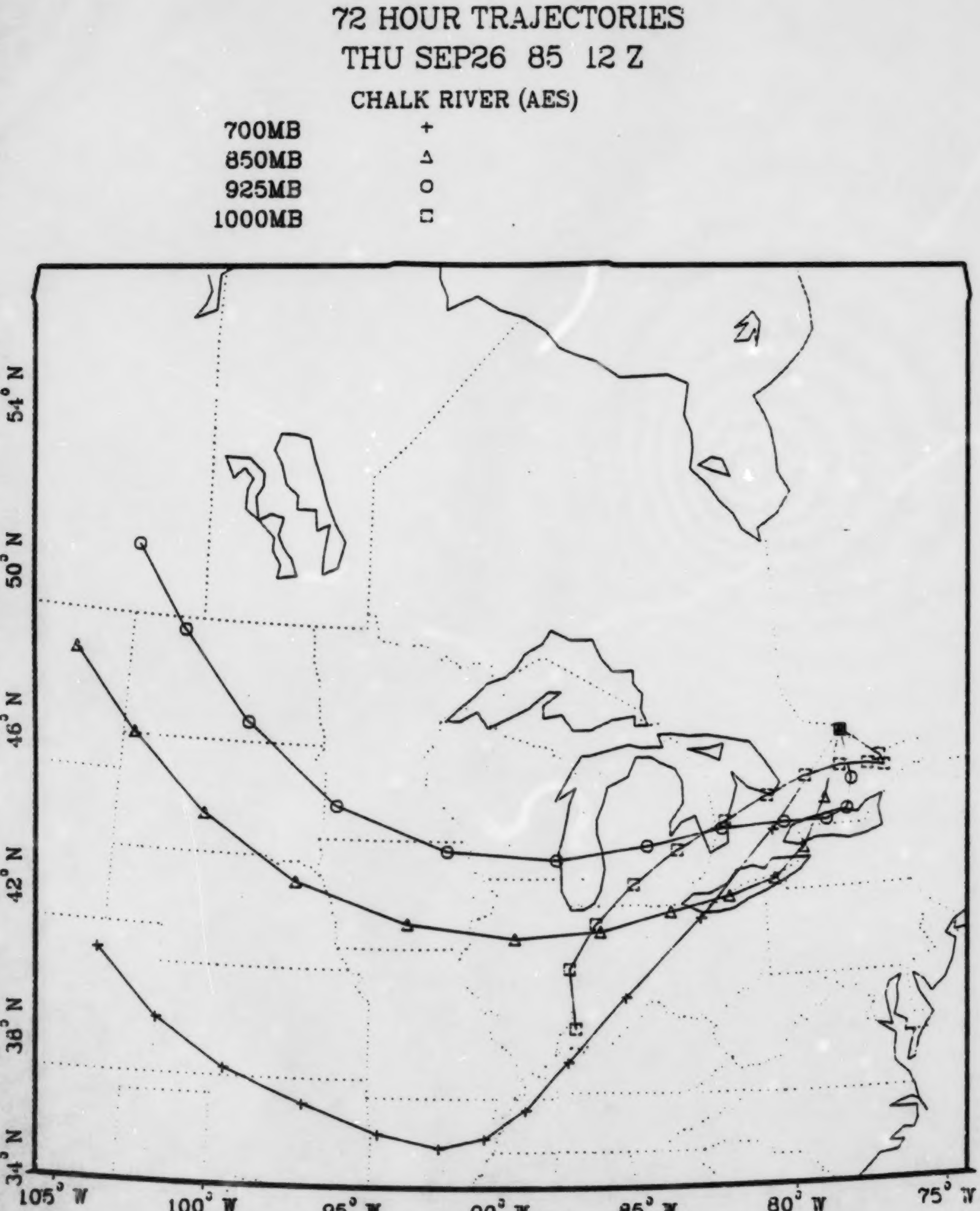
FIGURE 1.24.2

Petawawa A
Sep. 26-27, 1985



R - Rain
RW - Rain Showers

FIGURE 1.24.3



72 HOUR TRAJECTORIES
THU SEP26 85 12 Z
CHALK RIVER (AES)

700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.24.4

72 HOUR TRAJECTORIES
THU SEP26 85 18 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

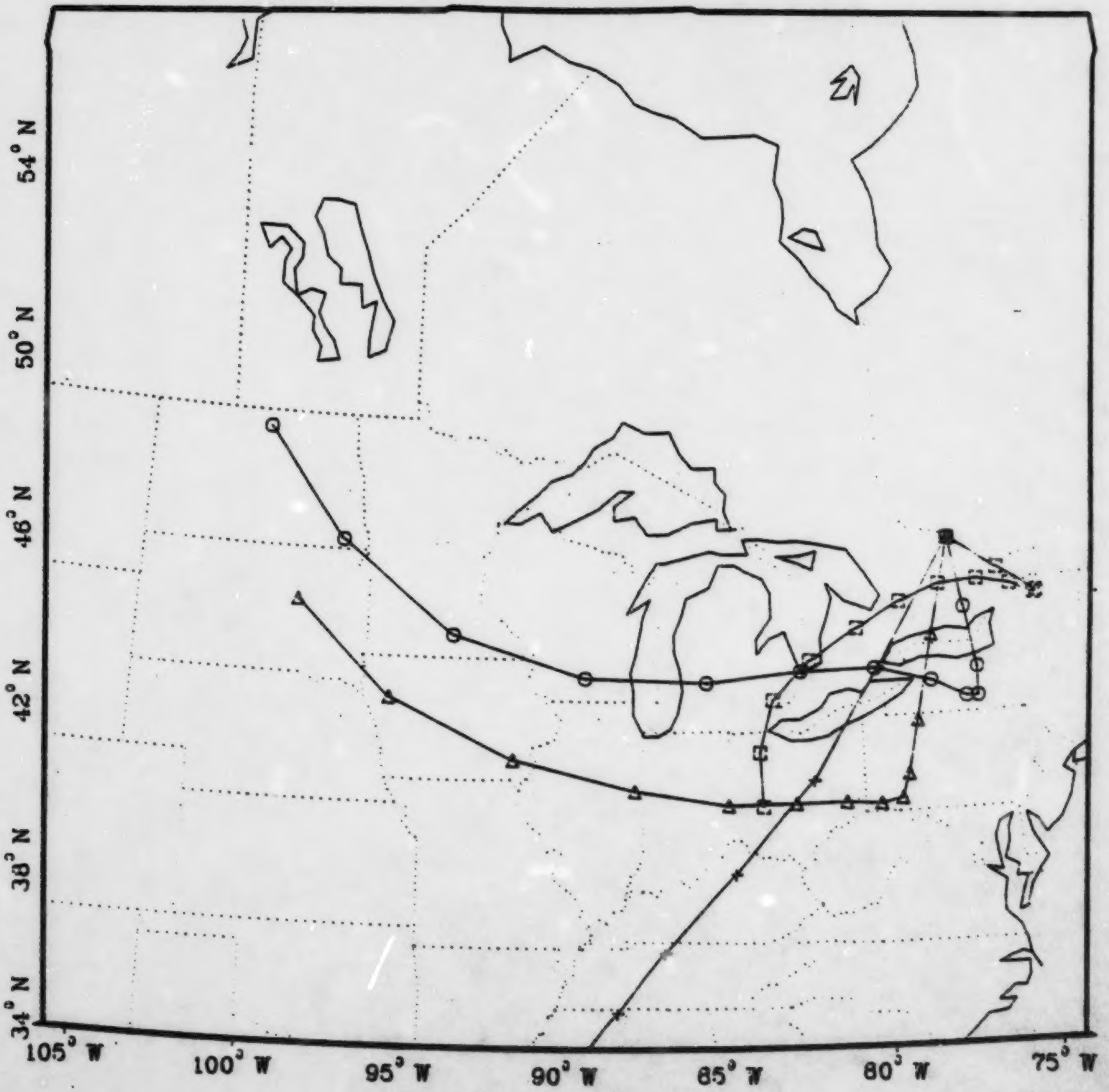

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.24.5

72 HOUR TRAJECTORIES
FRI SEP27 85 0 Z
CHALK RIVER (AES)

700MB	+
850MB	Δ
925MB	○
1000MB	□

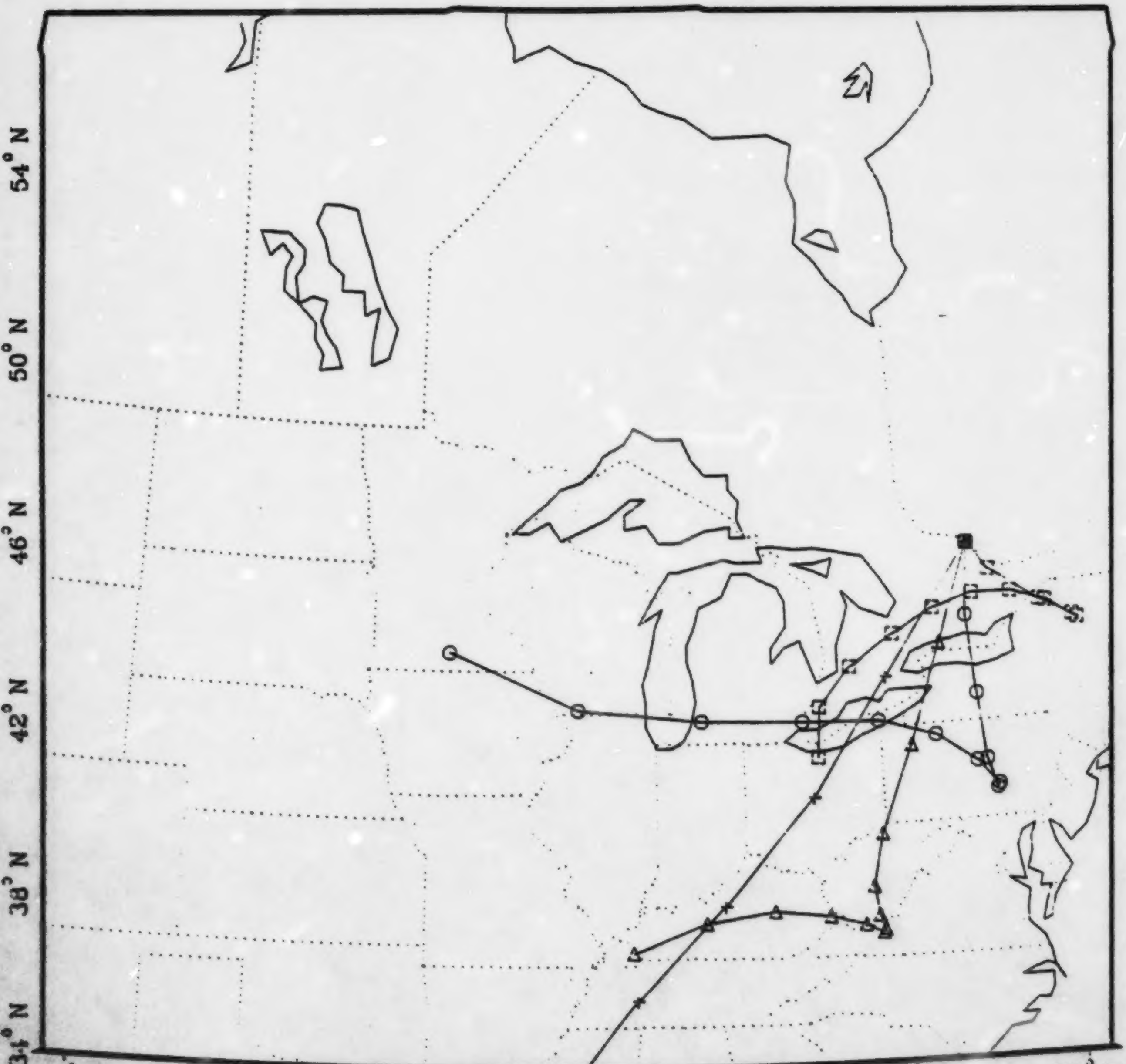

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.24.6

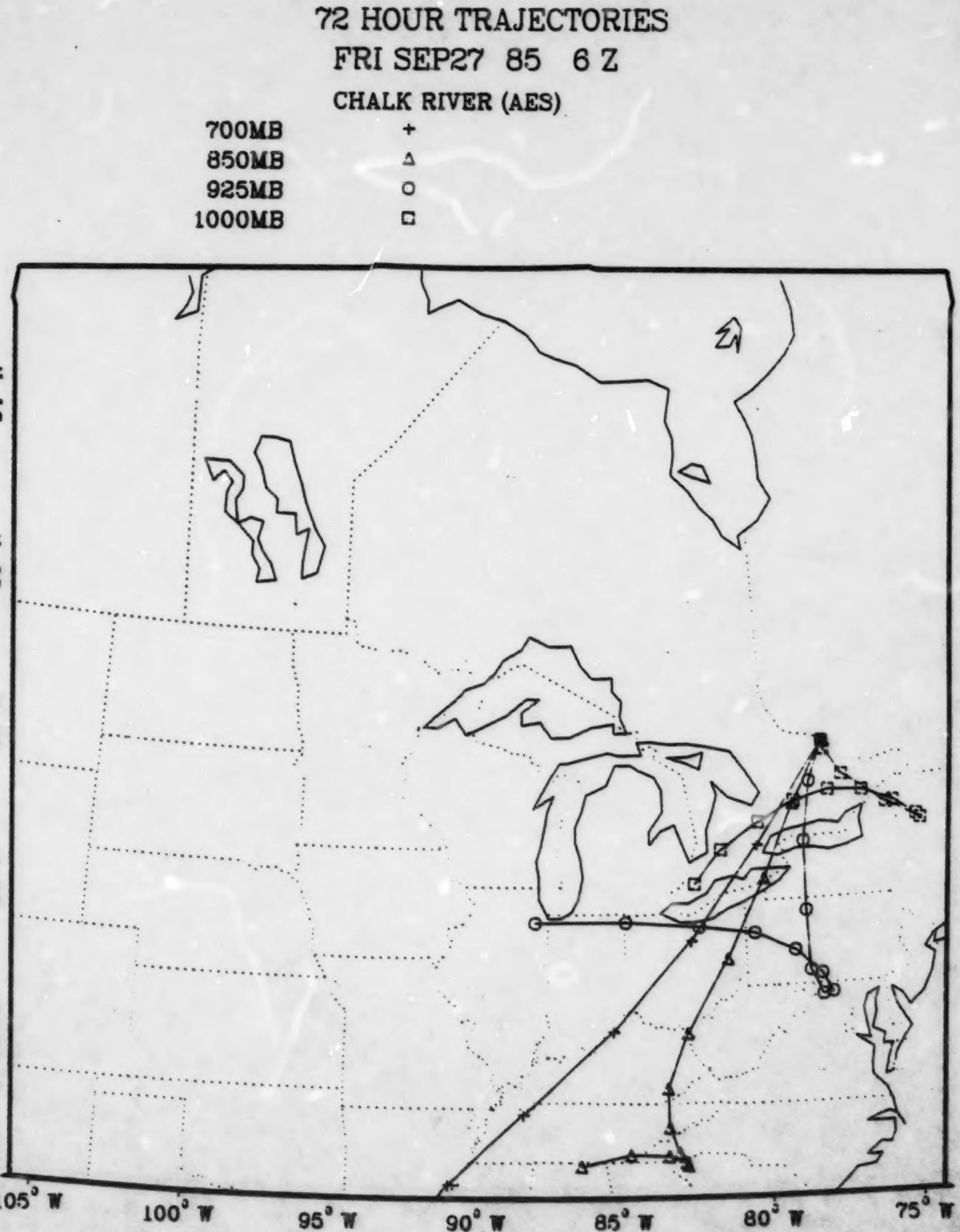

72 HOUR TRAJECTORIES
FRI SEP27 85 6 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.24.7

72 HOUR TRAJECTORIES
FRI SEP27 85 12 Z

CHALK RIVER (AES)

700MB	+
850MB	Δ
925MB	○
1000MB	□

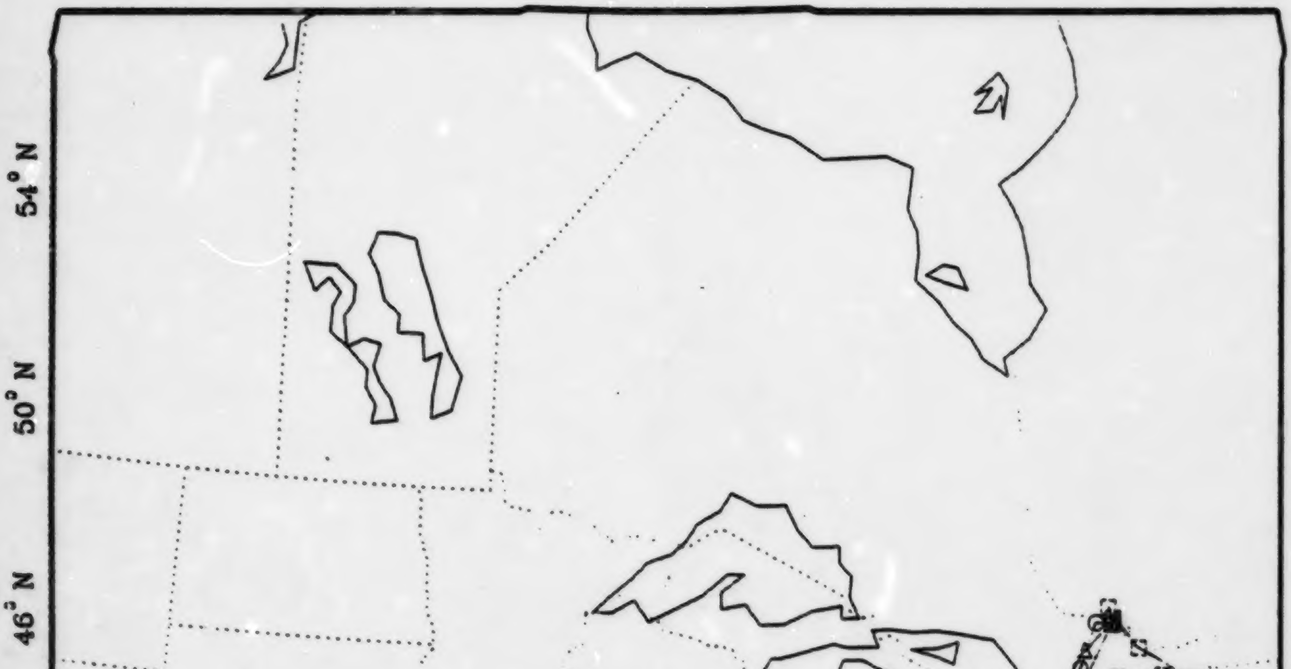

54° N
50° N
46° N
42° N
38° N
34° N
105° W
100° W
95° W
90° W
85° W
80° W
75° W

FIGURE 1.24.8

1.25 September 30- October 1, 1985, Chalk River & Dorset

This episode was included in the top 25% wet deposition events for two stations, viz., Chalk River and Dorset. For Chalk River, it was ranked 5th for both $SO_4^=$ (5/5) and NO_3^- (5/7). For Dorset, it ranked 7th and 2nd for $SO_4^=$ (7/8) and NO_3^- (2/12), respectively.

Chalk River

Two frontal systems associated with a very large continuous precipitation area were analyzed on September 30, at 12Z, as shown in Fig.1.25.1. A warm front extending from Wisconsin, where a low pressure centre of 1009 mb was observed, to Georgian Bay affected the weather at the station as the system moved in a NE direction and the warm front passed over it. The station remained in the warm sector with the low, deepening to 1001 mb, over Lake Superior on October 1, at 09Z, as illustrated in Fig. 1.25.2. Since the synoptic map for Oct. 1, 12Z is unavailable, the synoptic conditions at 09Z are described in Fig. 1.25.2. With the approach and crossing over of the warm front, the continuous precipitation area covered Chalk River region and very light and light rain and rain showers were recorded at the nearest weather station Petawawa for about 16 hours as shown in Fig. 1.25.3A. For a short duration, as shown in the figure, on October 1 morning rain and drizzle were simultaneously observed.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Chalk River for September 30, at 12Z, 18Z and October 1, at 00Z, 06Z and 12Z are shown in Figures 1.25.4, 1.25.5, 1.25.6, 1.25.7 and 1.25.8 respectively.

Air trajectories for the 1000 mb level did not cross over any SO_2 and NO_x highest emission source regions. However, SO_2 from the high emission Sarnia, and Toronto-Buffalo area could have been carried as shown in Figs. 1.25.4-6.

Air parcels arriving at the 925 mb level could have carried SO_2 from its highest and NO_x from its high emission areas in Pennsylvania- Ohio- West Virginia states, as illustrated in Fig. 1.25.7 and Detroit as shown in Fig. 1.25.8.

Air trajectories for the 850 mb level show that SO_2 from its highest emission Detroit area (Fig. 1.25.5) and other area in Illinois (Fig. 1.25.8) could have been transported. NO_x from its high emission areas in these regions could also have been transported.

The air parcels arriving at 700 mb level could have carried SO_2 from highest emission area in Illinois as shown in Fig. 1.25.8.

Summarizing, a warm front crossed over the station and it remained in the warm sector. A continuous precipitation area surrounded the station and yielded rain and rain showers of very light and light intensities for a long period of time(>16 hrs). Transport of SO_2 at low level(925 mb) from its highest emission sources in Pennsylvania, Ohio, west Virginia, and Detroit and at high level(850 mb & 700 mb) from Detroit and Illinois was likely. NO_x transport from its high emission areas in these areas was also probable. No NO_x highest emission source was involved.

Dorset

As for Chalk River, a warm front over Georgian Bay on September 30, at 12Z as shown in Fig. 1.25.1, crossed over Dorset and the station appeared to remain mostly in the warm sector as shown in Fig. 1.25.2. The large continuous area covered Dorset but unfortunately data are missing for most of the period as indicated in Fig. 1.25.3B. As shown in this figure, light rain was recorded on October 1 morning.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for September 30, at 12Z, 18Z and October 1, at 00Z, 06Z and 12Z are shown in Figures 1.25.9, 1.25.10, 1.25.11, 1.25.12 and 1.25.13 respectively.

Air trajectories for the 1000 mb level show that SO_2 from its highest and NO_x from its high emission Detroit area during 12Z, Sept. 30, - 06Z, Oct. 1 (see Fig. 1.25.9-12) and Pittsburg and other areas in Pennsylvania during 06Z-12Z, on Oct. 1, as shown in Figs.1.25.12-13, could have been transported.

Air trajectories for the 925 mb level show that SO_2 and NO_x from their respective highest and high emission regions in Ohio-West Virginia, as shown in Figs. 1.25.10-11, and Detroit area, as illustrated in Fig. 1.25.12, could have been transported.

Air parcels arriving at the 850 mb level could have carried SO_2 from its highest emission Detroit on Sept. 30, 12Z-18Z (Figs. 1.25.9-10), Chicago on Oct. 1, at 12Z (Fig. 1.25.13) and other area in Illinois during 06Z-12Z on Oct. 1, and also NO_x from its highest emission Chicago area on Oct. 1 at 12Z as shown in Fig. 1.25.13. NO_x from its high emission areas could also have been transported.

Air trajectories for the 700 mb level show that SO_2 from the highest emission area in Illinois could have been transported for a short duration on Oct. 1, as shown in Fig. 1.25.13. No Highest NO_x emission source is involved.

In summary, a warm front crossed over the station and it remained in the warm sector. A continuous precipitation area covered the station but unfortunately complete observations are not available. Transport of SO_2 at low level (1000 mb & 925 mb) from its highest emission areas in Detroit region, Pennsylvania, Ohio, West Virginia and at high level (850 mb & 700 mb) from Detroit, Chicago and other area in Illinois was probable. Transport of NO_x from its highest emission Chicago area at high level(850 mb) and a number of high emission areas was also likely.

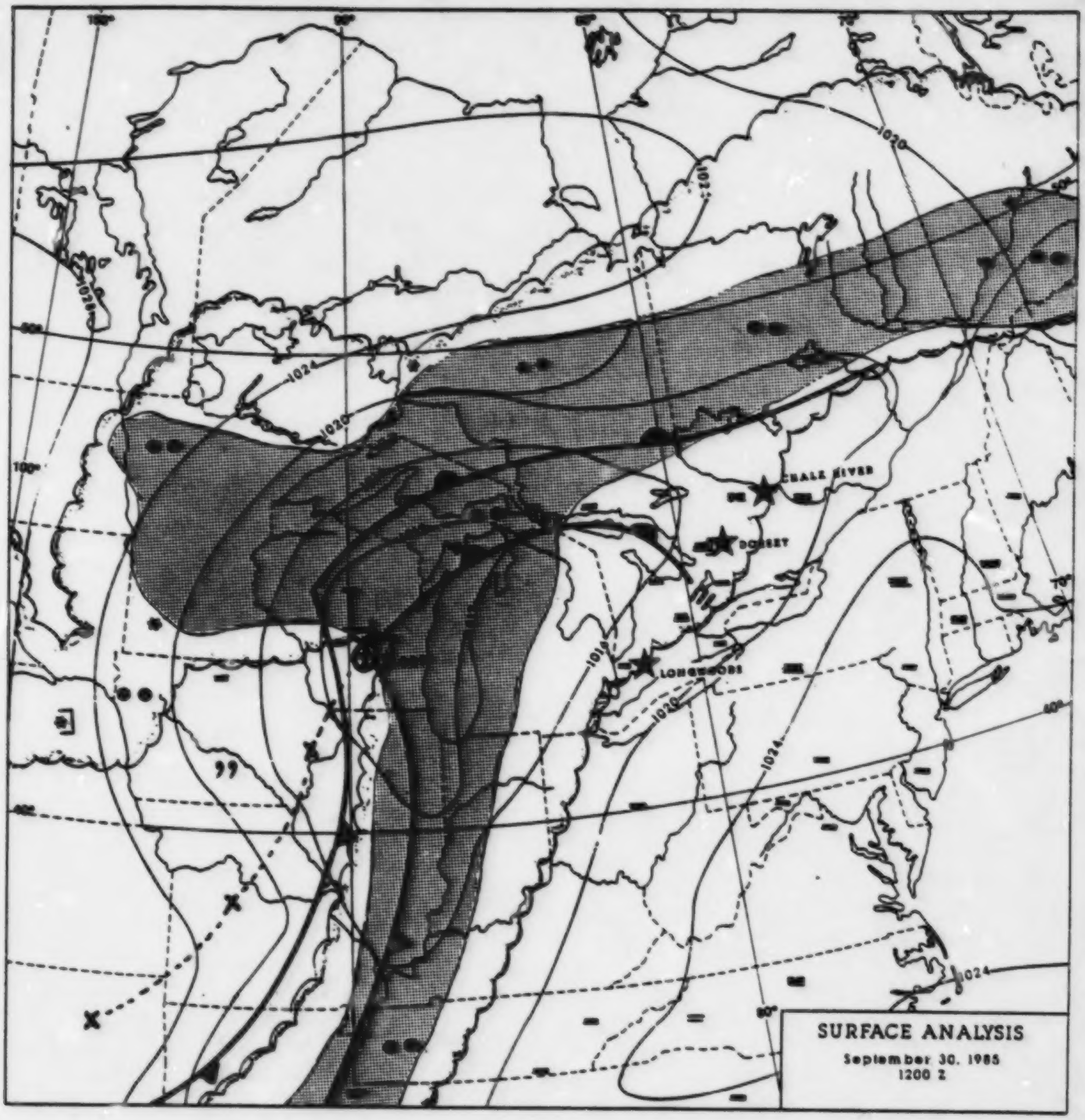

1020
1024
1028
1016
CHALK RIVER
DORSET
LONGWOODS
1020
1024
SURFACE ANALYSIS
September 30, 1985
1200 Z

FIGURE 1.25.1

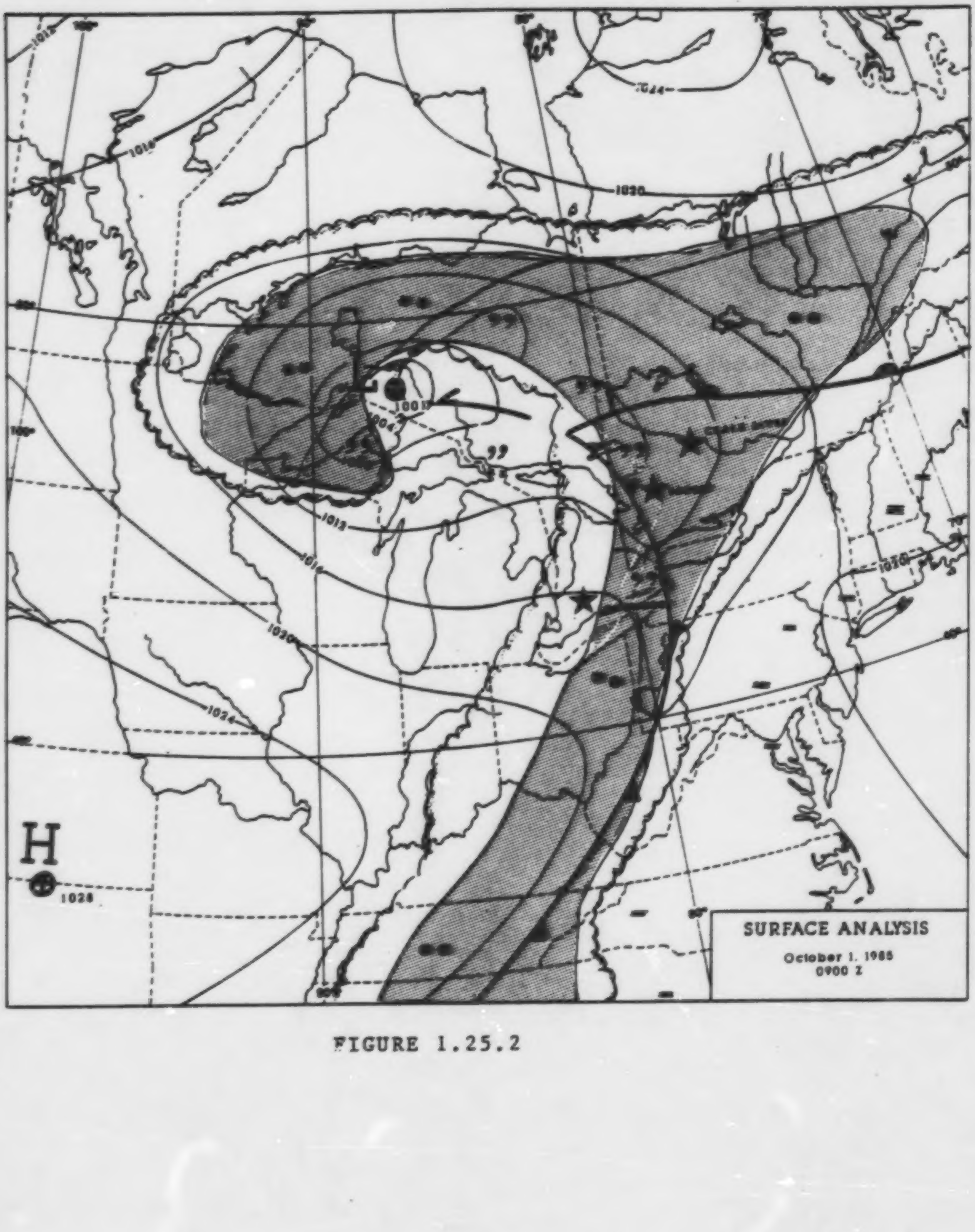
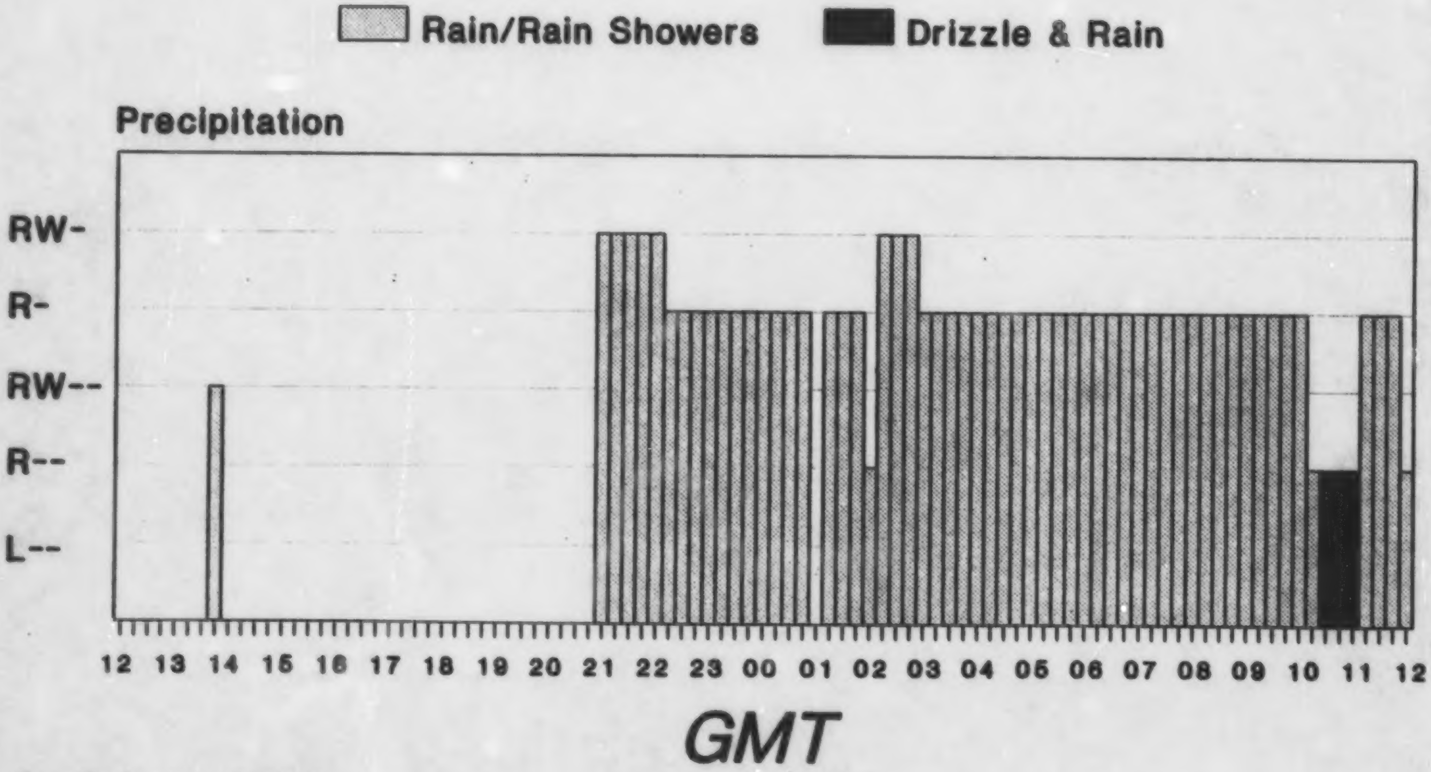

SURFACE ANALYSIS
October 1, 1985
0900 Z
H
1028
1024
1020
1016
1012
1008
1004
1001
99

FIGURE 1.25.2

Petawawa A

Sep. 30 - Oct. 1, 1985



R - Rain, L - Drizzle
RW - Rain Showers

FIGURE 1.25.3A

Muskoka A

Sep. 30 - Oct. 1, 1985

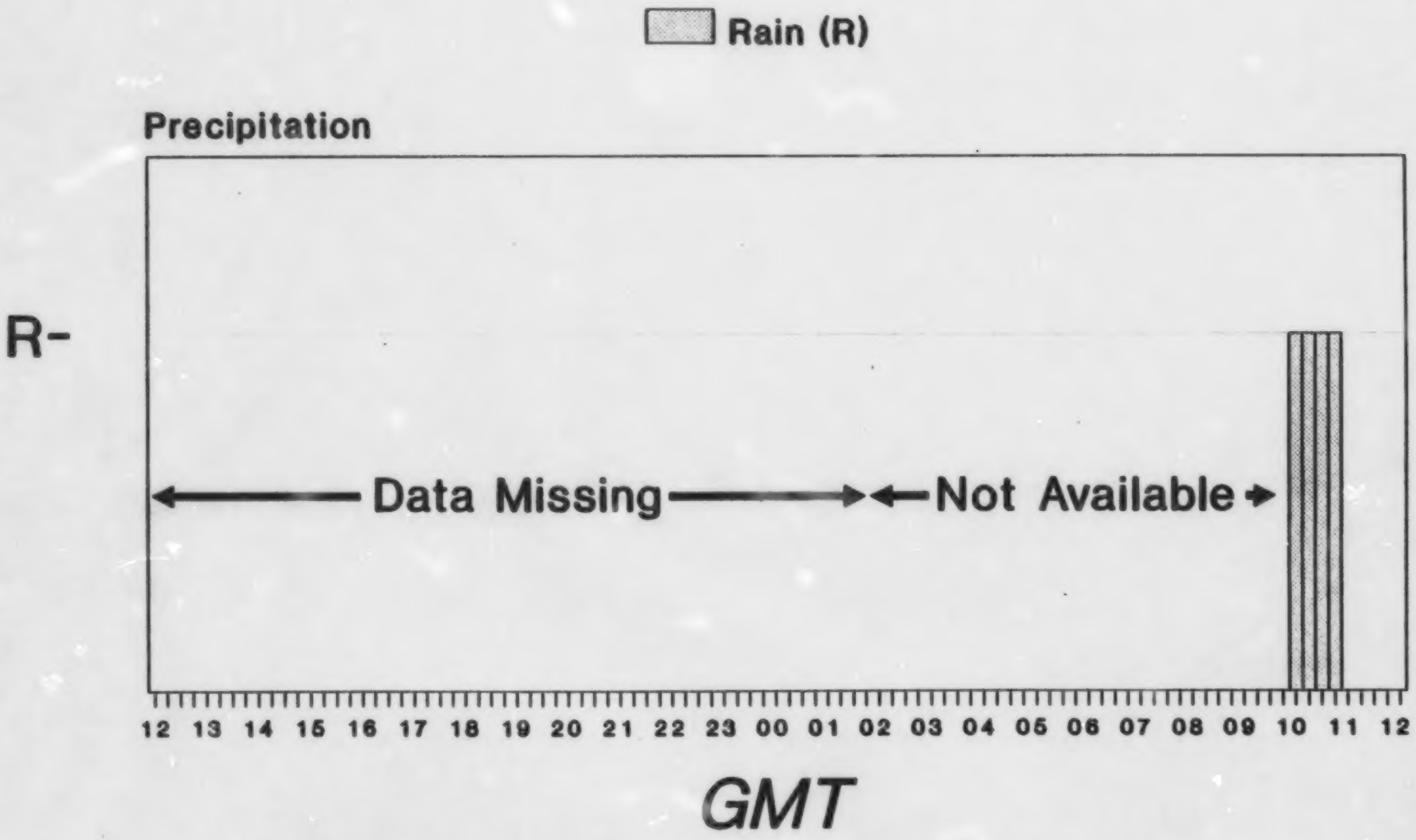
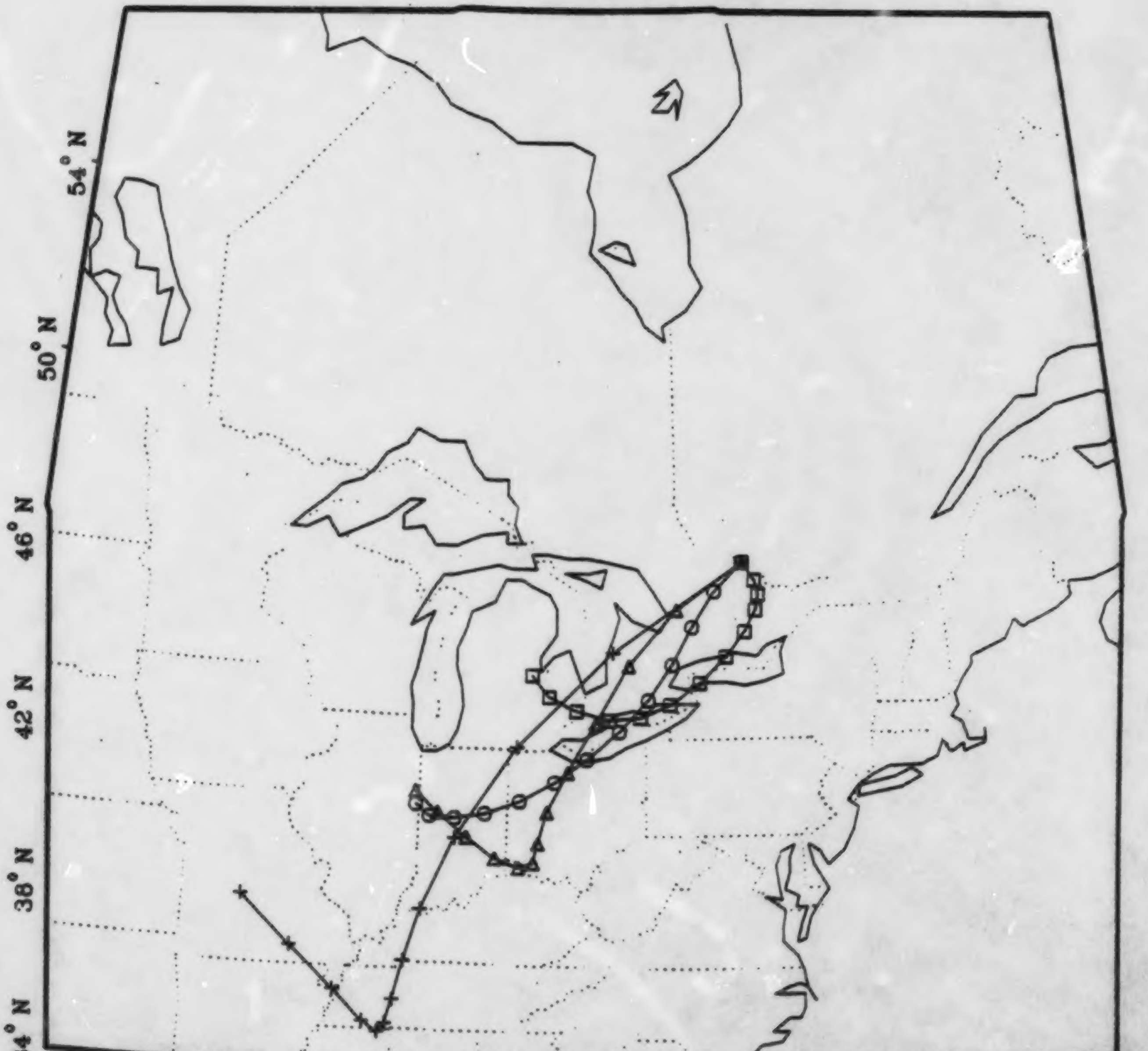


FIGURE 1.25.3B

72 HOUR TRAJECTORIES
MON SEP30 85 12 Z
CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.4

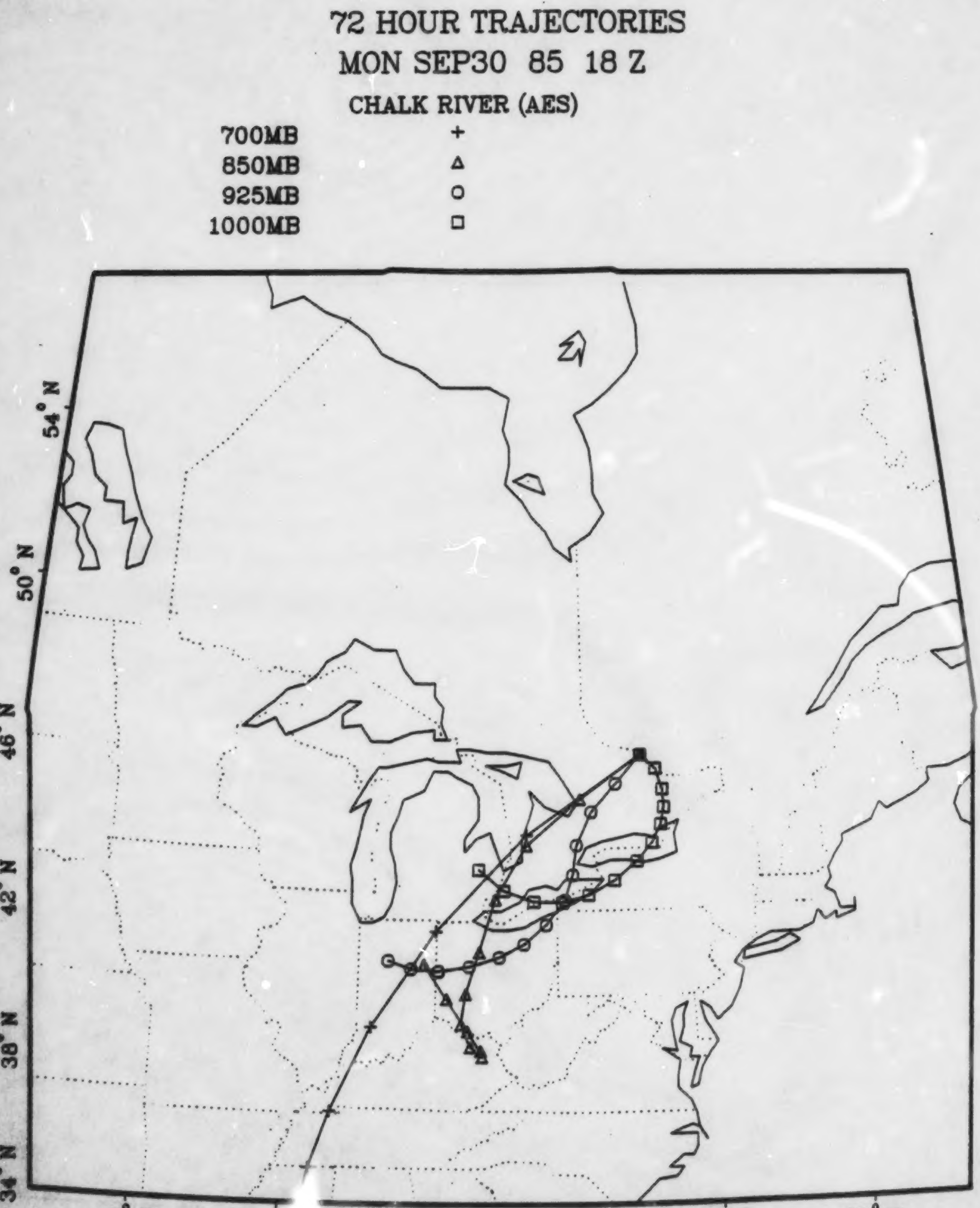

72 HOUR TRAJECTORIES
MON SEP30 85 18 Z
CHALK RIVER (AES)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.5

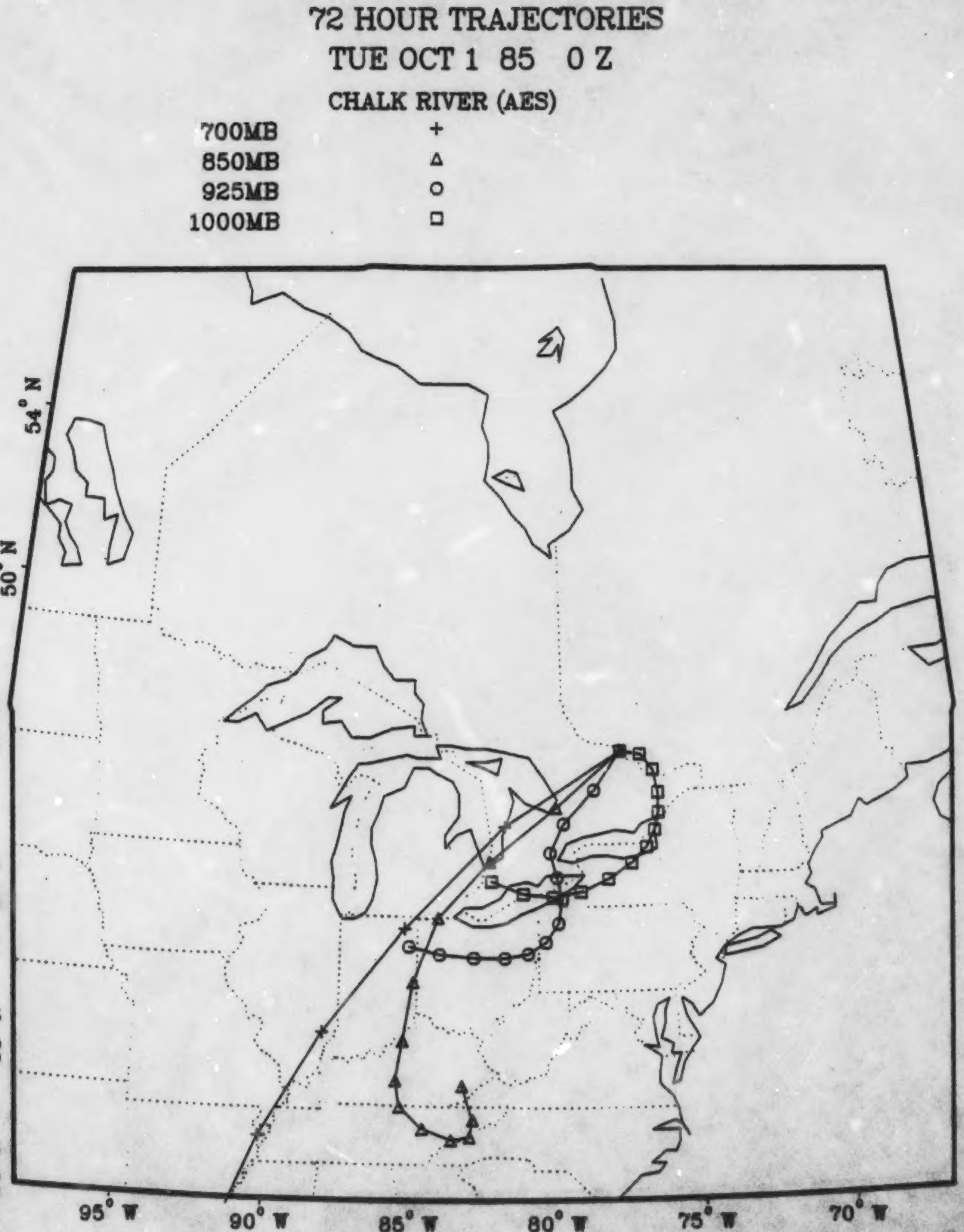

72 HOUR TRAJECTORIES
TUE OCT 1 85 0 Z
CHALK RIVER (AES)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

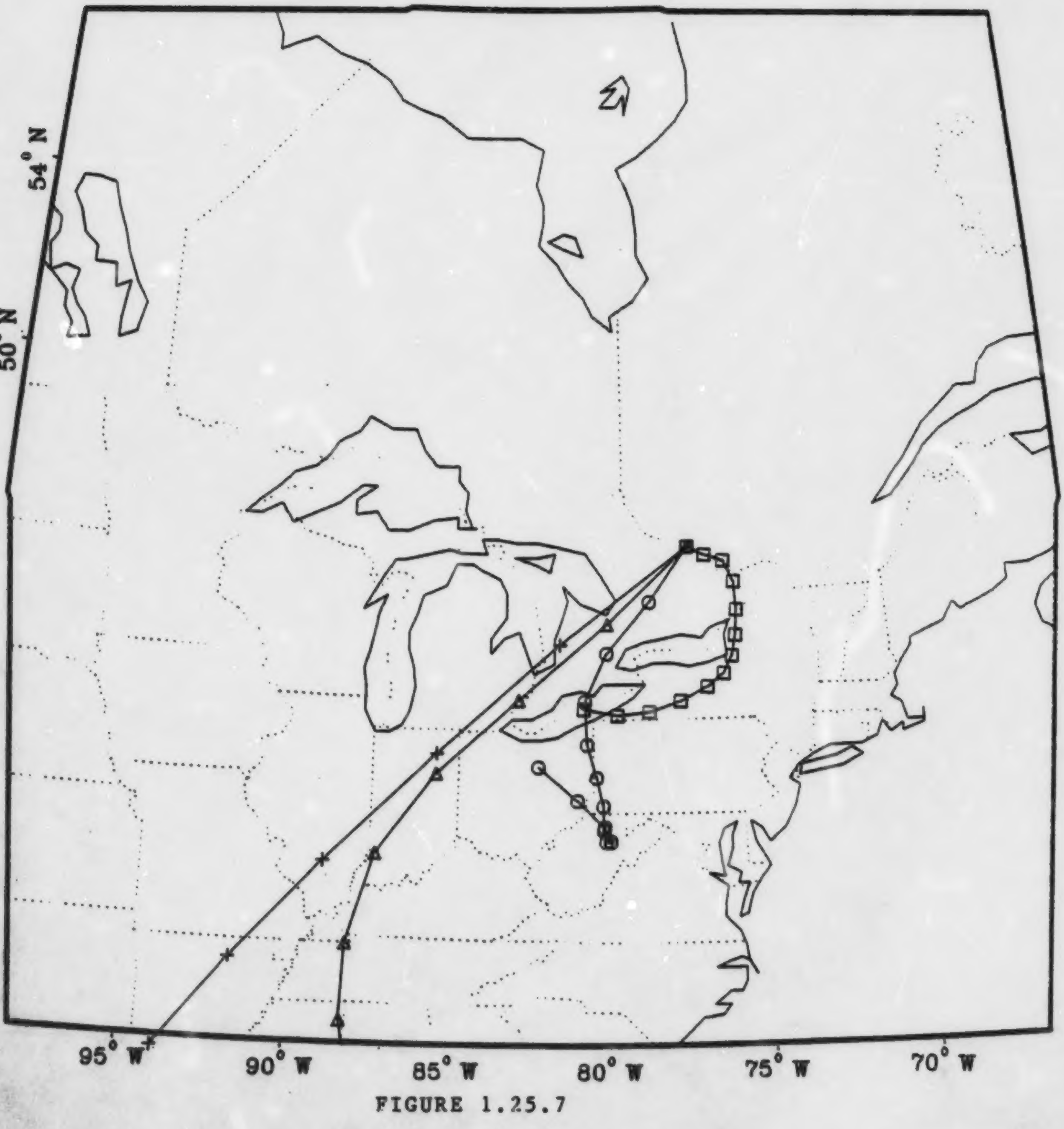
FIGURE 1.25.6

72 HOUR TRAJECTORIES

TUE OCT 1 85 6 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.7

72 HOUR TRAJECTORIES
TUE OCT 1 85 12 Z

CHALK RIVER (AES)

700MB	+
850MB	△
925MB	○
1000MB	□

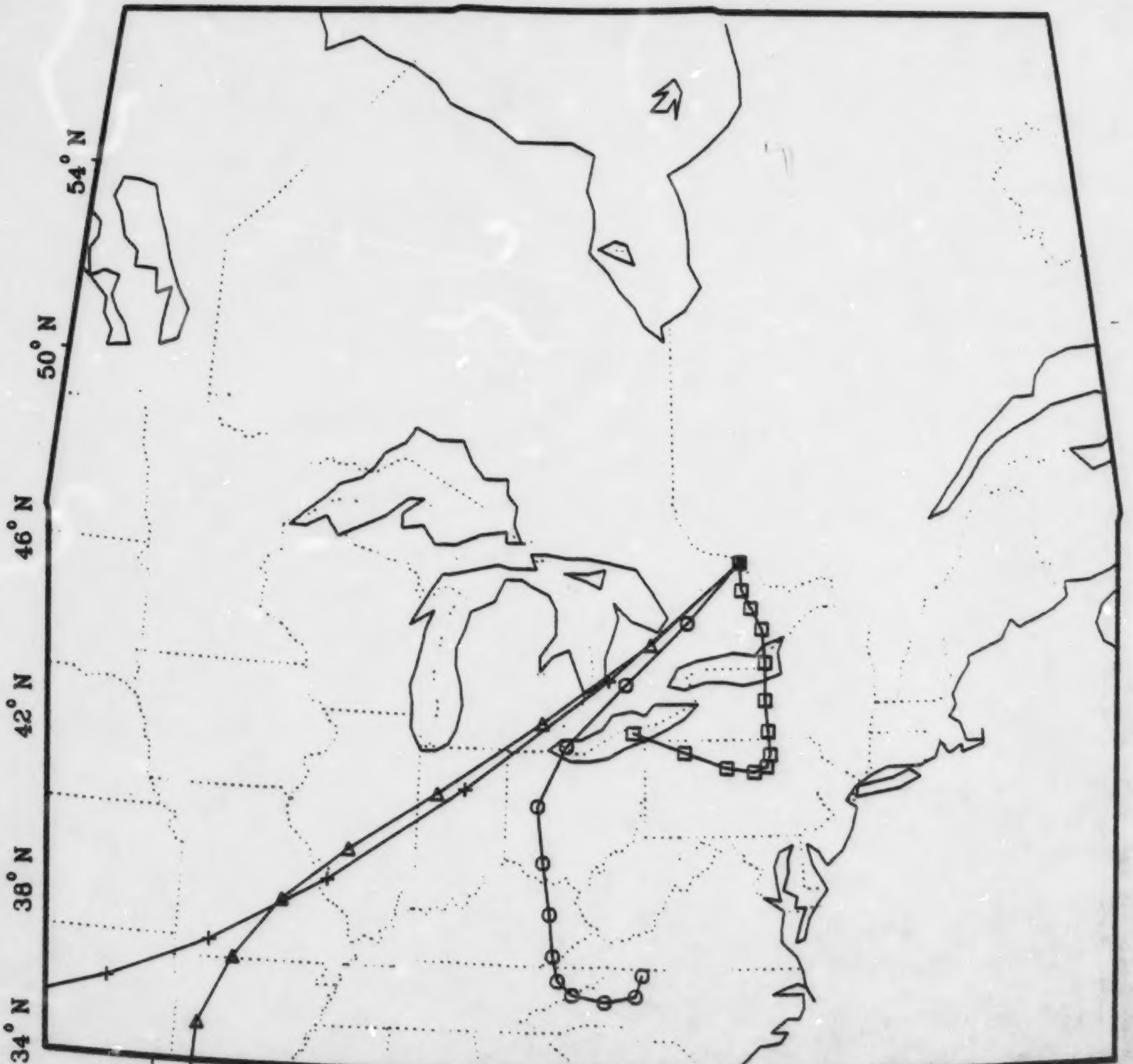

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.8

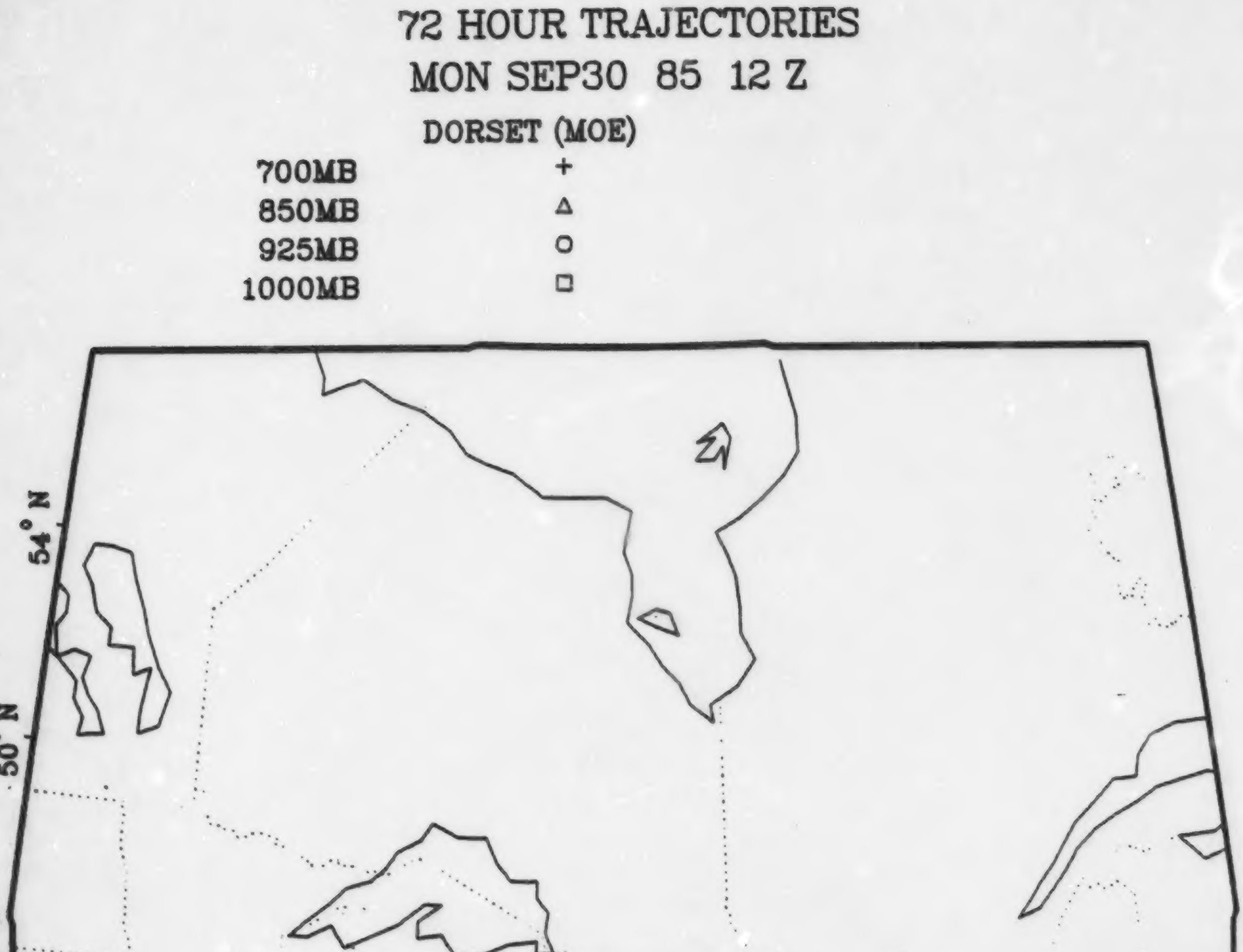

72 HOUR TRAJECTORIES
MON SEP30 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.9

72 HOUR TRAJECTORIES
MON SEP30 85 18 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

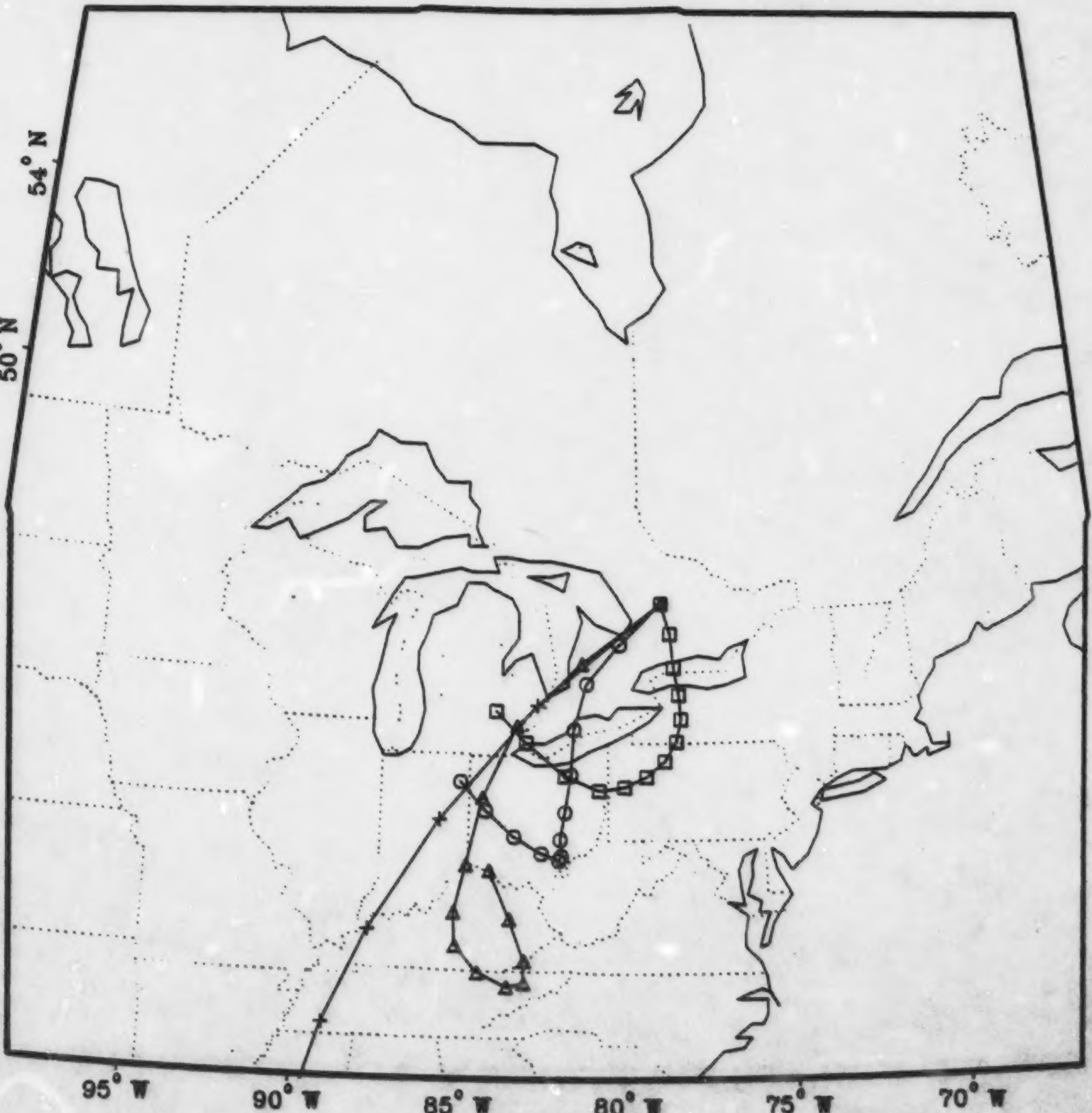

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.10

72 HOUR TRAJECTORIES
TUE OCT 1 85 0 Z
DORSET (MOE)

700MB	+
850MB	Δ
925MB	○
1000MB	□

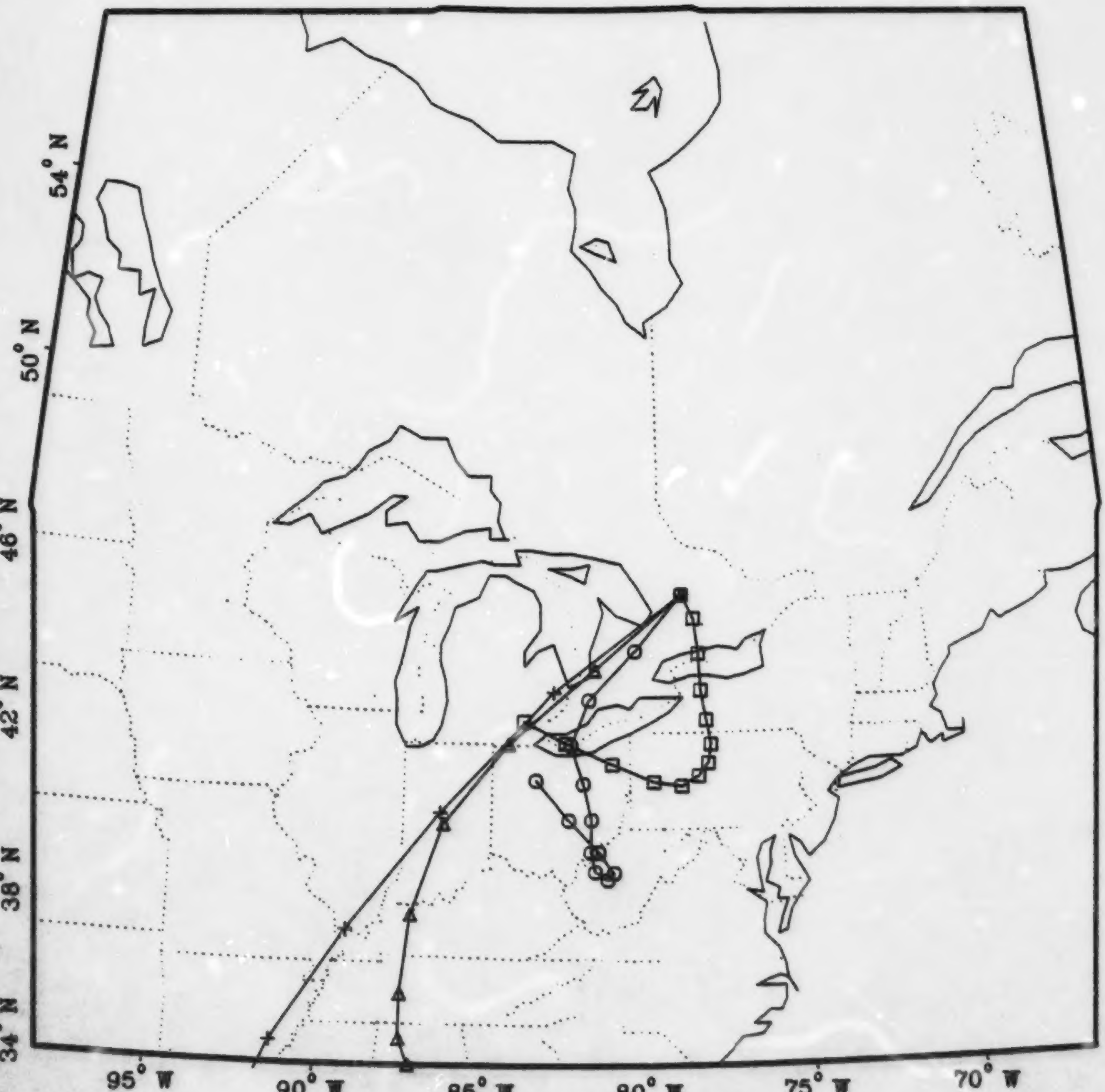
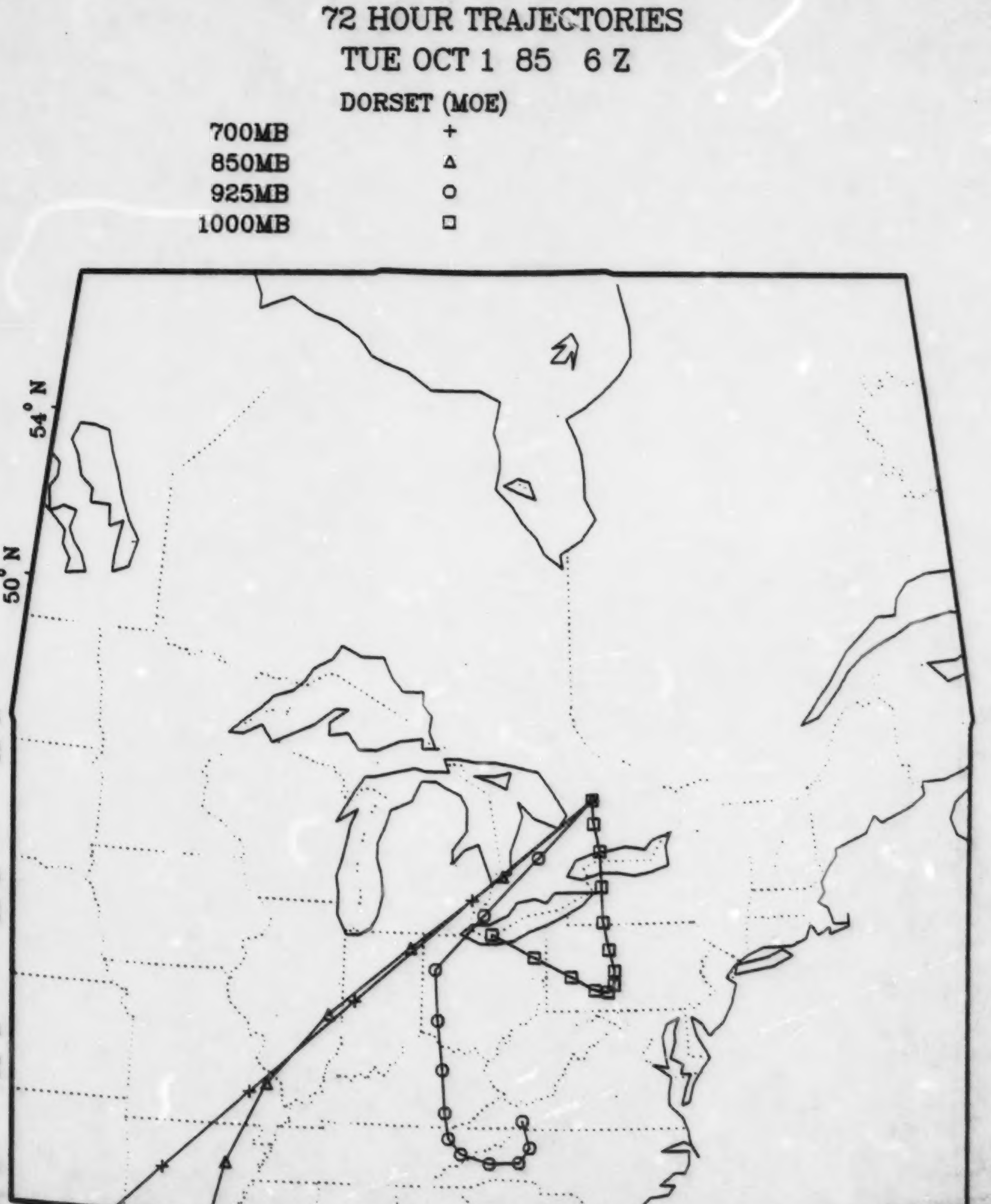

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.11

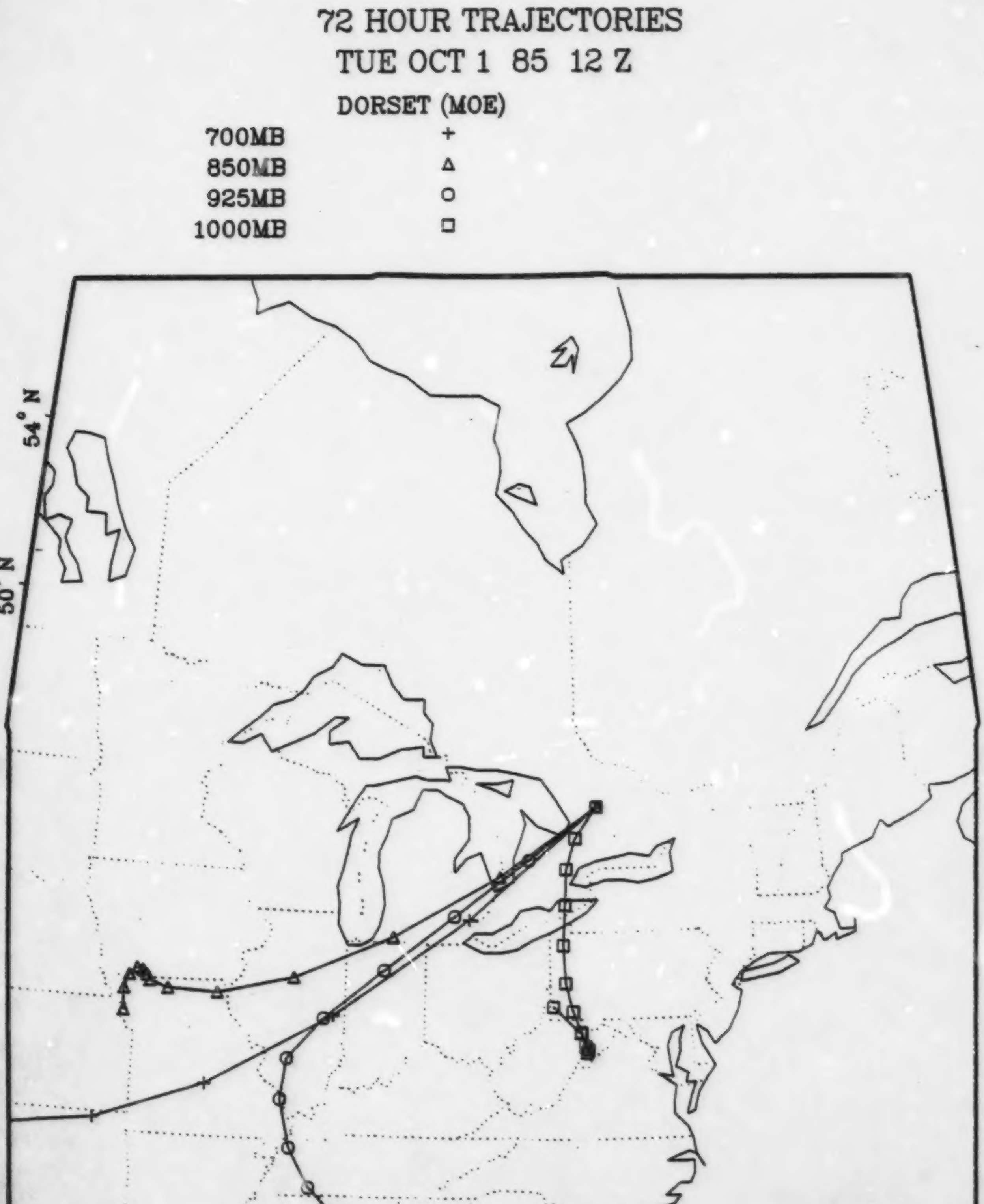


72 HOUR TRAJECTORIES
TUE OCT 1 85 6 Z
DORSET (MOE)

700MB +
850MB △
925MB ○
1000MB □

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.12



72 HOUR TRAJECTORIES
TUE OCT 1 85 12 Z
DORSET (MOE)

700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.25.13

1.26 October 4 - 5, 1985. Dorset

This episode was ranked 10th (10/12) only in the NO_3^- top 25% wet deposition events.

A low pressure centre, 998 mb, over Wisconsin near Minnesota border and the associated frontal system on October 4, at 12Z as shown in Fig. 1.26.1, moved NE and the cold front passed over Dorset on Oct. 5 early morning hours. As shown in Fig. 1.26.2, on Oct. 5 at 12Z, the front was situated east of the station and the low was located over northern Ontario near Chapleau. With the passage of the cold front, rain showers were observed as shown in Fig. 1.26.3, but unfortunately precipitation observations are not available for the complete duration of the episode.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for October 4, at 12Z, 18Z and October 5, at 00Z, 06Z and 12Z are shown in Figures 1.26.4, 1.26.5, 1.26.6, 1.26.7 and 1.26.8 respectively.

Air trajectories for the 1000 mb level did not pass over any highest or high NO_x emission regions and therefore any pollution transport would be insignificant.

Air parcels arriving at the 925 mb level could have carried NO_x from the highest emission Chicago area, as illustrated in Fig. 1.26.4-5, and high emission areas in Ohio(Fig. 1.26.5&8), Pennsylvania (Fig. 1.26.5-6), and West Virginia (Fig. 1.26.6-8).

Air parcels arriving at the 850 mb level show that NO_x could have been transported from its high emission area in Ohio-West Virginia (Fig. 1.26.5), Detroit, Michigan (Fig. 1.26.8) and for some short period from Cleveland, Ohio region (Fig. 1.26.7-8).

Air trajectories for the 700 mb level show that NO_x from its high emission areas in Detroit region (Figs. 1.26.5&8) and Cleveland, Ohio (Figs. 1.26.6-7) could have been transported.

Summarizing, a cold front passage yielded rain showers at the station. The transport of NO_x from the highest emission Chicago area at low level (925 mb) and a number of other high emission areas at high and low level was probable during this episode.

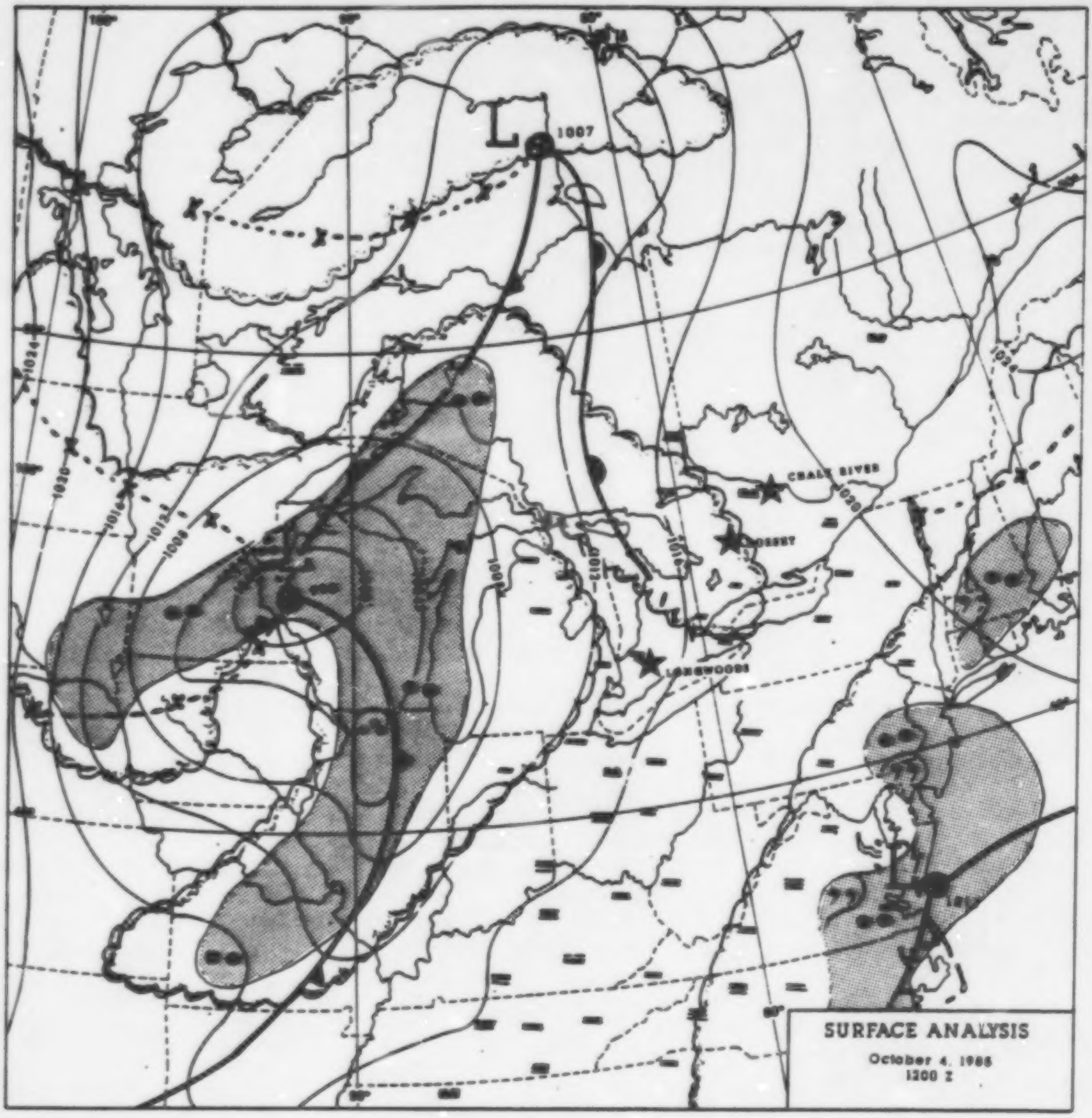

L
1007
CHALK RIVER
DORSET
LONGWOODS
1024
1020
1016
1012
1008
1004
SURFACE ANALYSIS
October 4, 1986
1200 Z

FIGURE 1.26.1

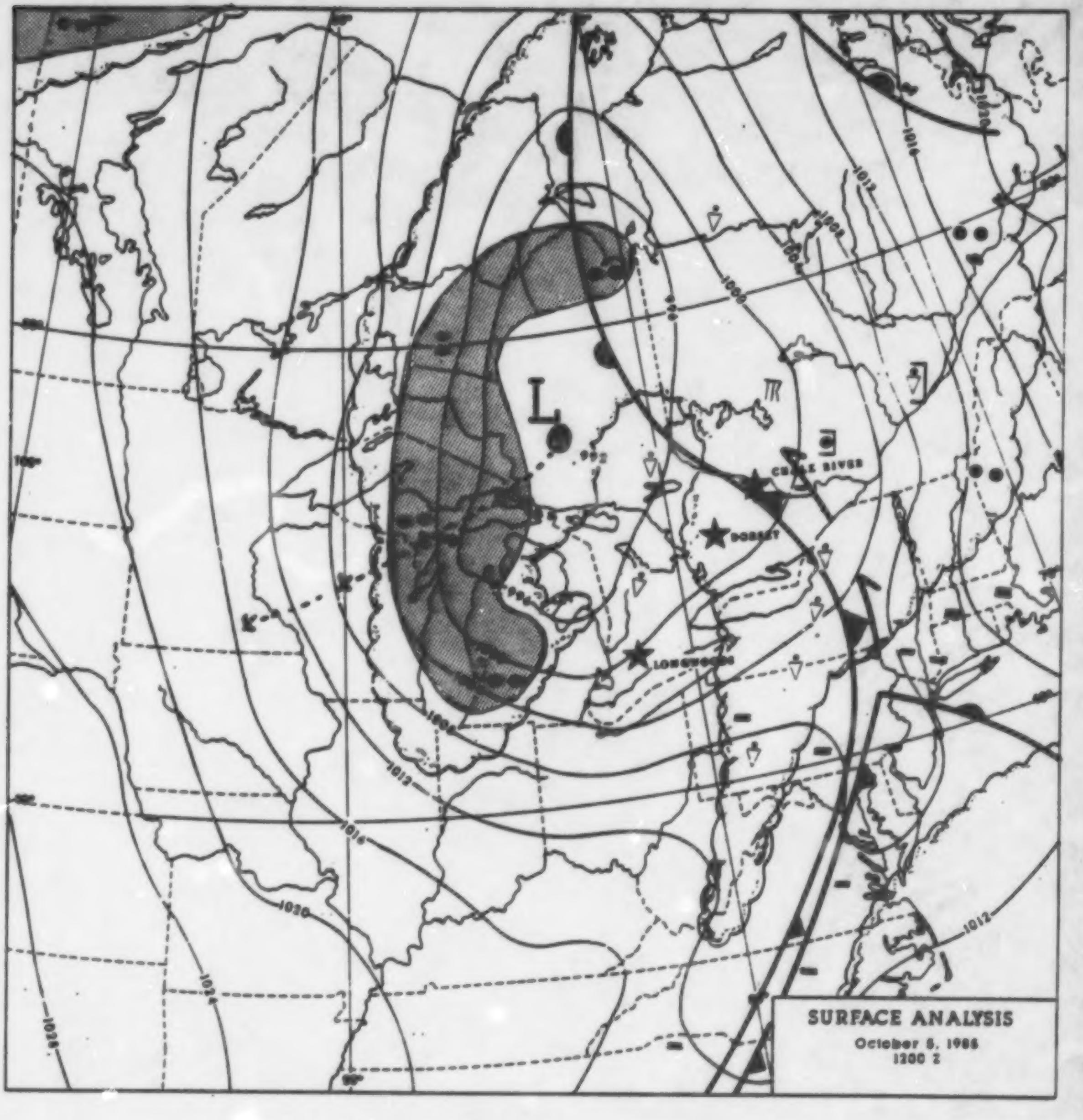

SURFACE ANALYSIS
October 5, 1986
1200 Z
L
992
996
1000
1004
1008
1012
1016
1020
1024
1028
CHALK RIVER
DORSET
LONGWOODS

FIGURE 1.26.2

Muskoka A
Oct. 4-5, 1985

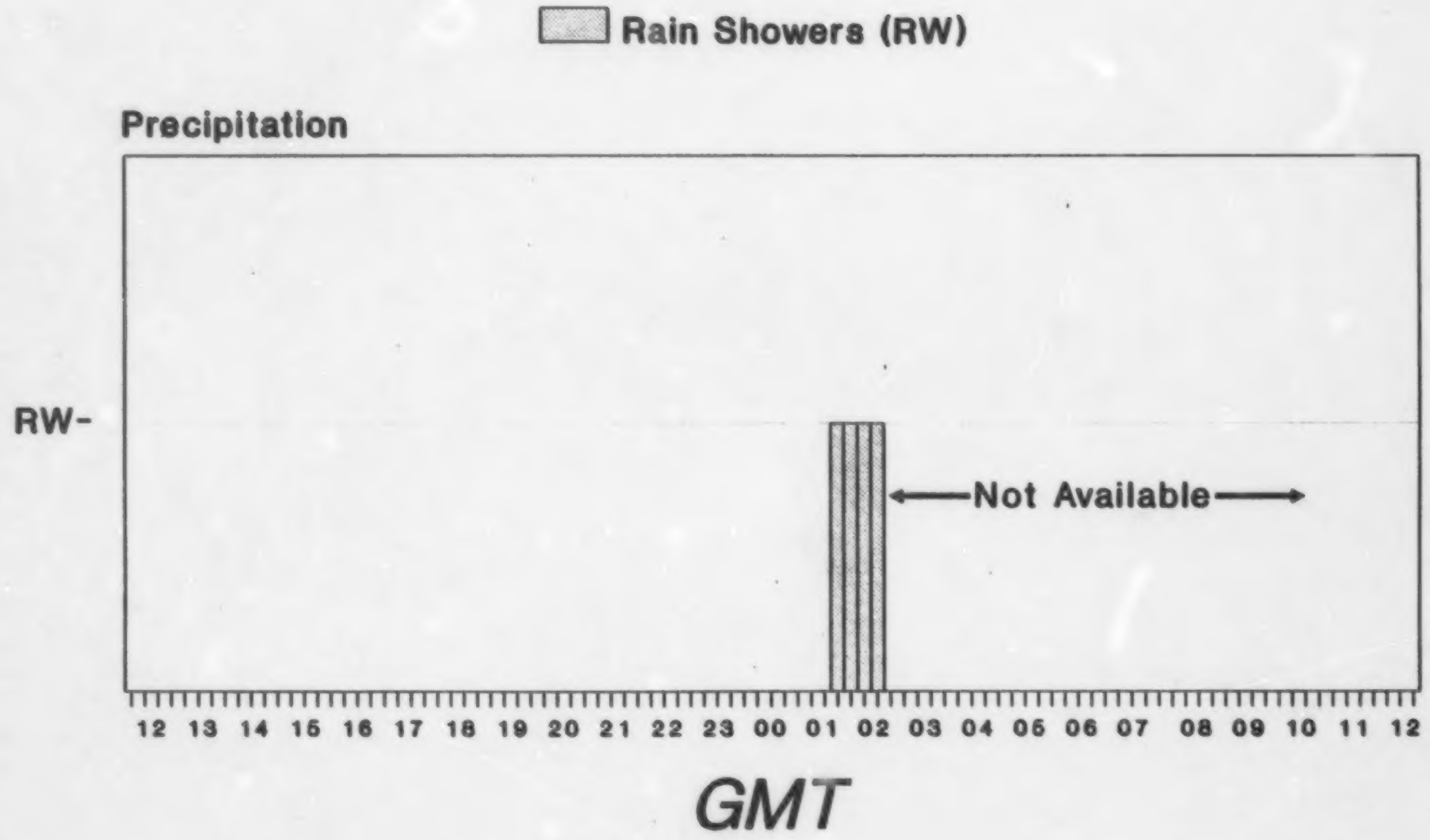


FIGURE 1.26.3

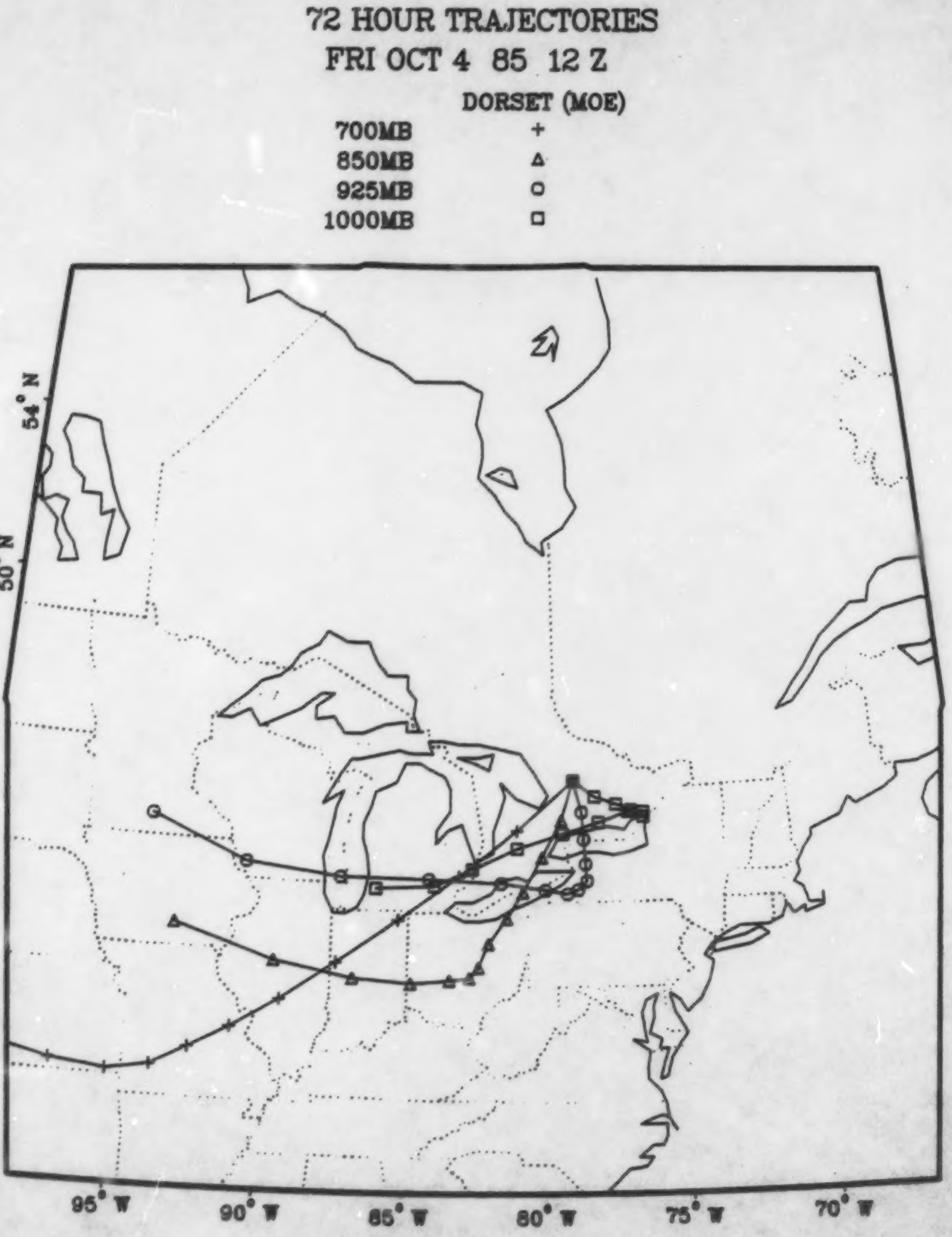

72 HOUR TRAJECTORIES
FRI OCT 4 85 12 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.26.4

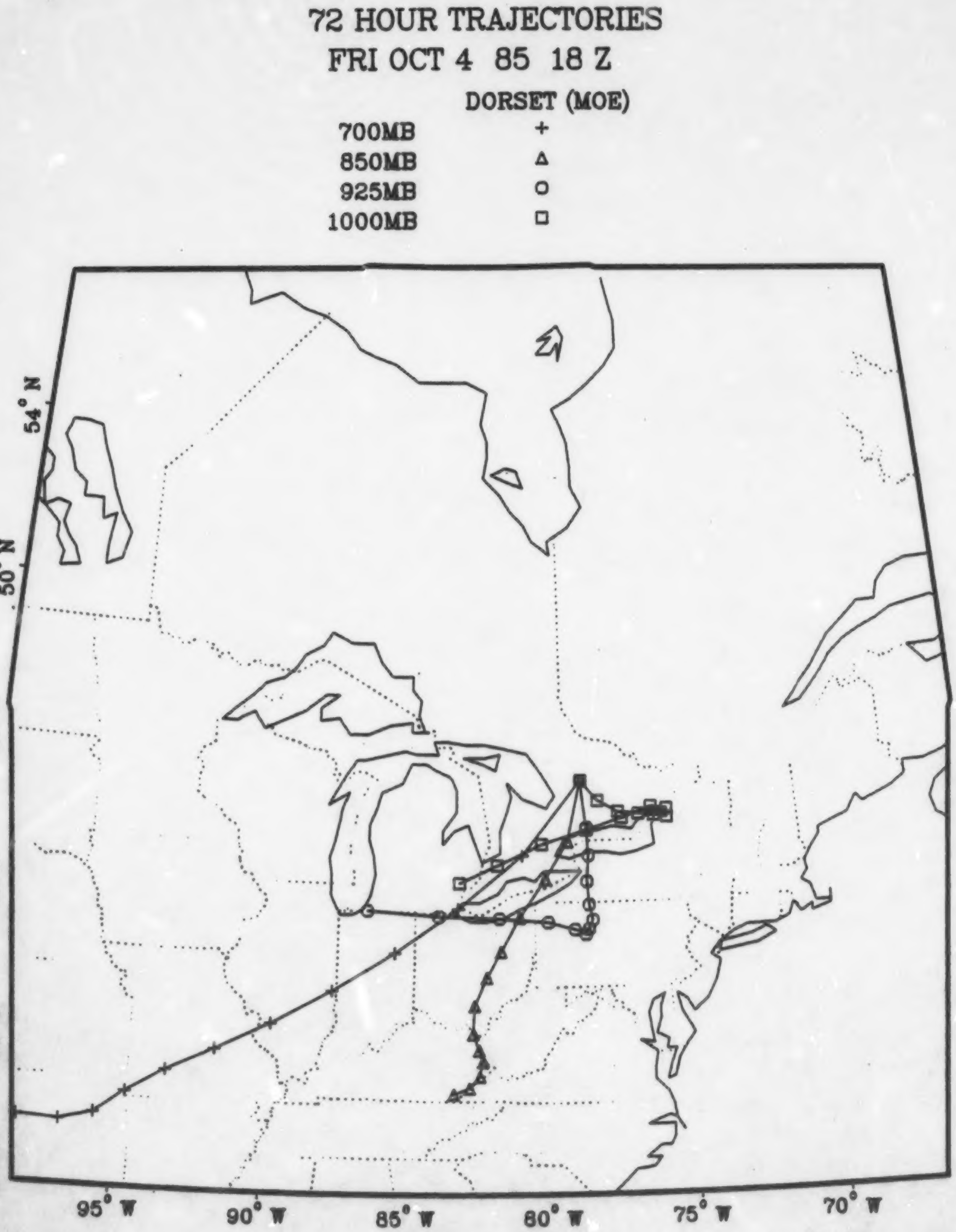

72 HOUR TRAJECTORIES
FRI OCT 4 85 18 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.26.5

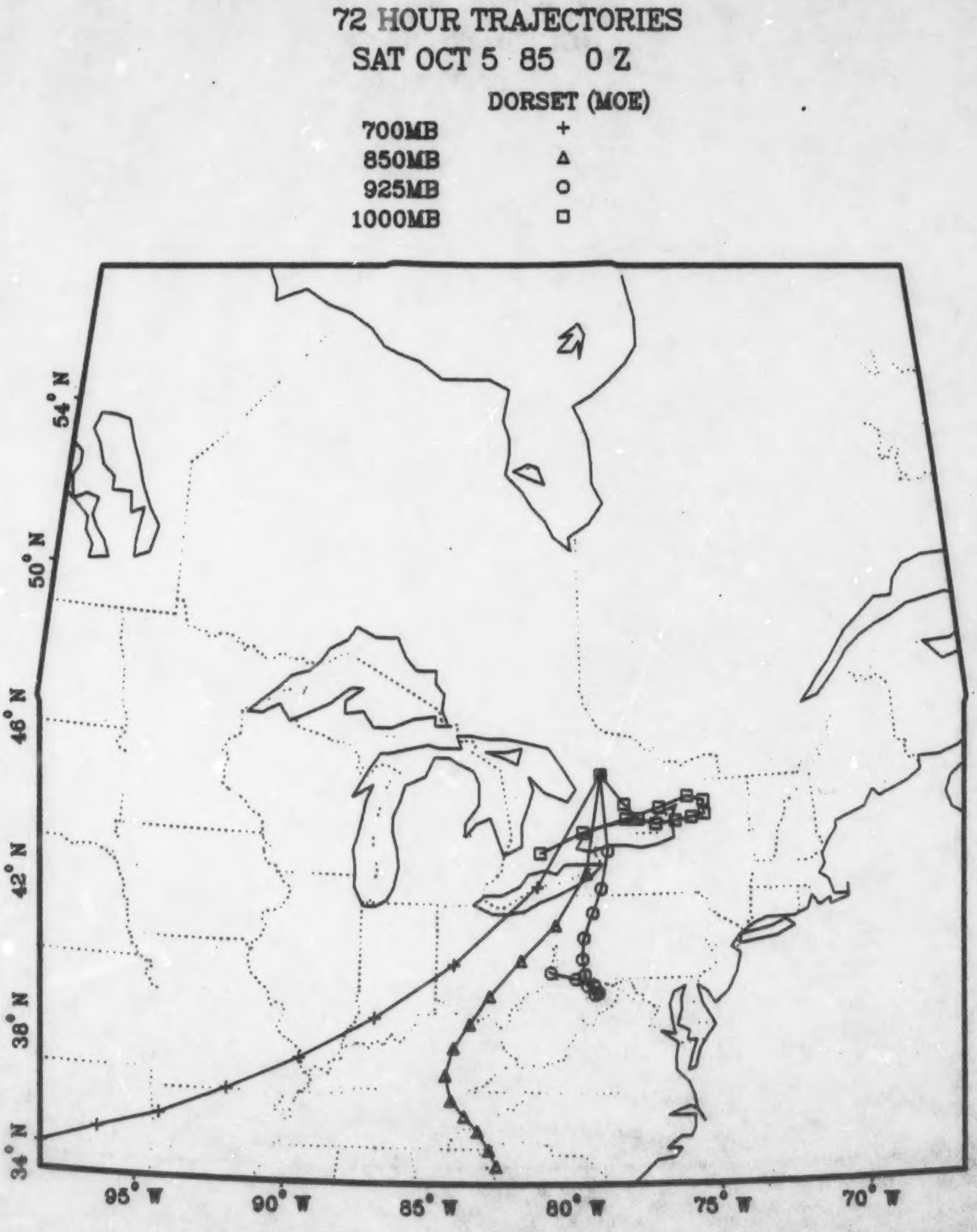

72 HOUR TRAJECTORIES
SAT OCT 5 85 0 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.26.6

72 HOUR TRAJECTORIES
SAT OCT 5 85 6 Z

	DORSET (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

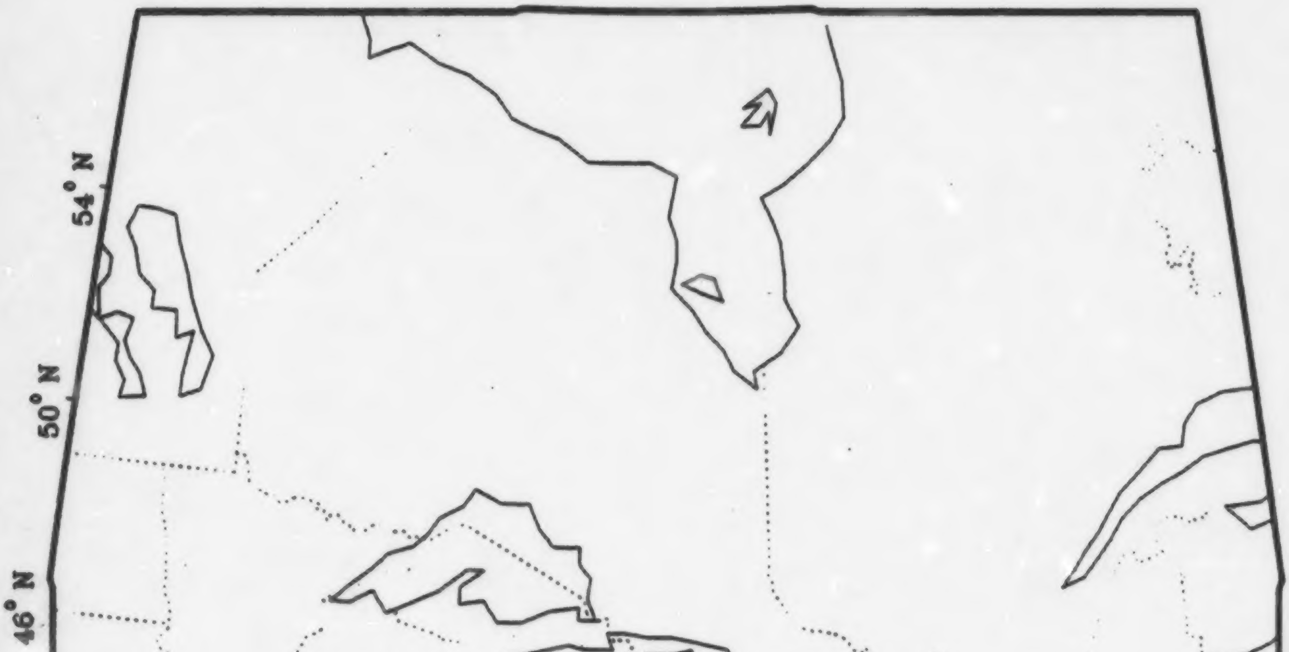
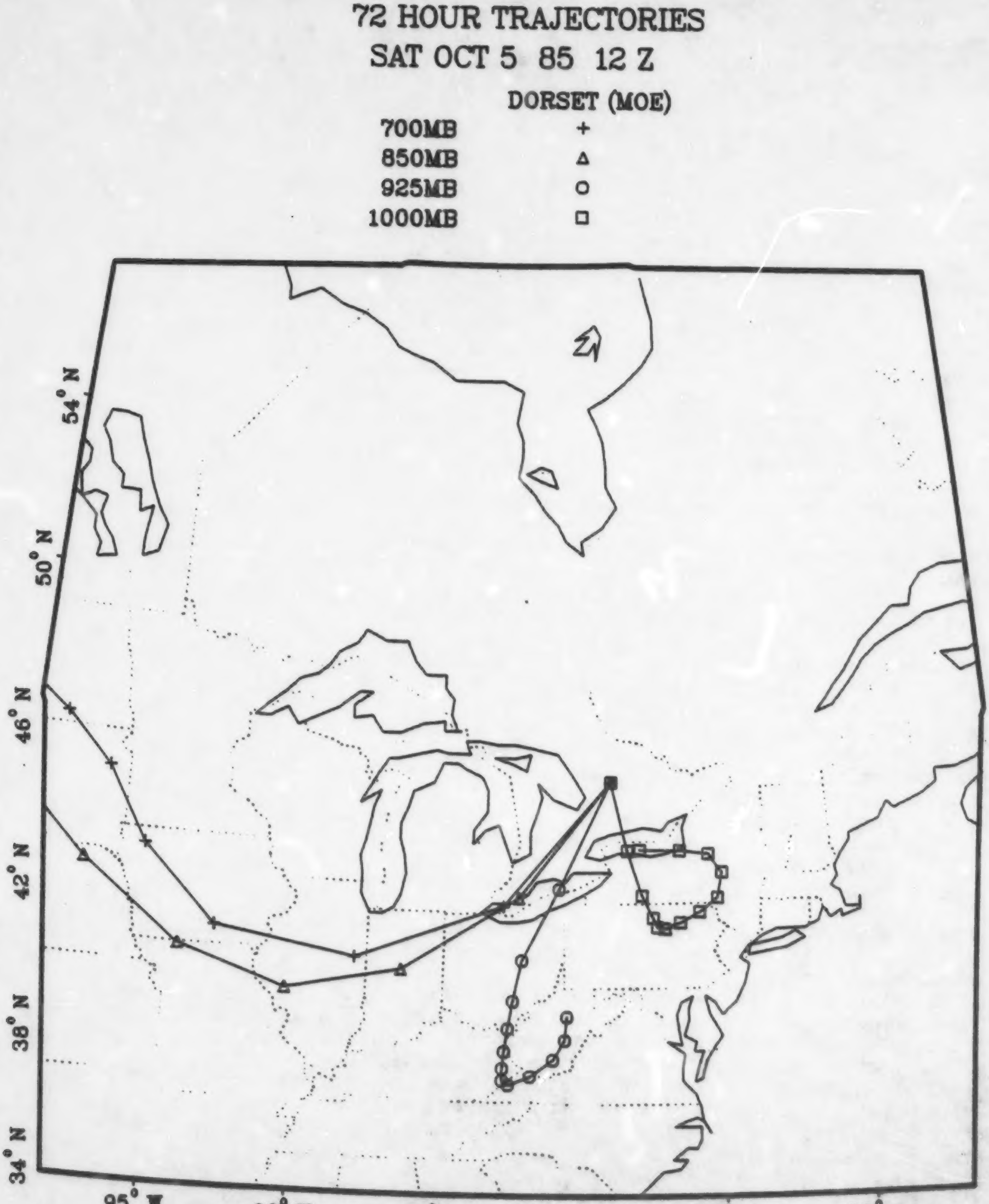

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.26.7



72 HOUR TRAJECTORIES
SAT OCT 5 85 12 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.26.8

1.27 October 12-13, 1985, Longwoods(AES & MOE) and Dorset

This is a multi-station episode as it was counted in the top 25% events for both Longwoods and Dorset stations. The rankings for $SO_4^=$ are 5th (5/8) for Longwoods(AES) and 4th (4/8) for Longwoods(MOE). For Dorset, it ranked 2nd for $SO_4^=$ (2/8). For all three stations it did not appear in their lists of NO_3^- top 25% wet deposition events.

Longwoods

On October 12, at 12Z, two frontal systems, one associated with a low pressure centre of 1004 mb near the border of Minnesota, North Dakota and South Dakota states and the other associated with a wave near Wisconsin-Illinois-Iowa border, were analyzed as shown in Fig. 1.27.1. AS the systems moved NE, a warm and cold front passed over the station. On October 13, at 12Z, as shown in Fig. 1.27.2 the cold front of the occluded system had just passed over the station. With the passage of the warm front on October 12, light, moderate and heavy rain followed by rain mixed with drizzle and then drizzle of very light and light intensity were recorded as shown in Fig. 1.27.3A. As shown in the figure heavy rain showers were also recorded for about 1/2 hour. After this, showery precipitation was observed as the cold front approached and crossed over.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for October 12, at 12Z, 18Z and October 13, at 00Z, 06Z and 12Z are shown in Figures 1.27.4, 1.27.5, 1.27.6, 1.27.7 and 1.27.8 respectively.

Air trajectories for the 1000 mb level show that SO_2 from its highest emission areas in Pennsylvania, Ohio and west Virginia (Fig. 1.27.8) and possibly Sudbury, Ontario (Fig. 1.27.4) could have been transported during this episode.

Air trajectories for the 925 mb level show that SO_2 from the highest emission areas in Detroit region (Fig. 1.27.5&7), Ohio-West Virginia (Fig. 1.27.6) and possibly Illinois (Fig. 1.27.6) could have been carried.

Air parcels arriving at the 850 mb level show that transport of SO_2 from its highest emission Detroit (Fig. 1.27.6&7), Chicago (Fig. 1.27.4&8) and other area in Illinois for some time in the beginning (see Fig. 1.27.4-5) and at the end (Fig. 1.27.7-8) of the episode was likely.

Air trajectories for the 700 mb level show that SO_2 from Chicago (Fig. 1.27.8) and other area in Illinois (Fig. 1.27.5-7) could have been transported.

In summary, a passage of warm and cold front yielded rain and rain showers up to heavy intensities as well as some drizzle. The total duration of precipitation events was about 11 hours. Transport of SO_2 from many sources was likely during this episode. Low level (1000 mb & 925 mb) transport from Detroit, Michigan, Pennsylvania, West Virginia and Ohio and high level transport (850 mb & 700 mb) from Detroit, Chicago and other area in Illinois were probable.

Dorset

The frontal system on October 12, at 12Z as shown in Fig. 1.27.1, that affected the weather at Longwoods also influenced Dorset and as shown in Fig. 1.27.2., the wave of the occluded system laid near the station on October 13, at 12Z. The continuous precipitation area associated with the system surrounded the station and light rain, very light, light and moderate rain showers were observed as shown in Fig. 1.27.3B. Unfortunately complete precipitation observations are not available but the synoptic maps indicated precipitation occurring for almost all the time on October 13. The drizzle was observed at the end of the precipitation period. It is almost certain that the precipitation lasted for about 16 hours at Dorset.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for October 12, at 12Z, 18Z and October 13, at 00Z, 06Z and 12Z are shown in Figures 1.27.9, 1.27.10, 1.27.11, 1.27.12 and 1.27.13 respectively.

Air parcels arriving at the 1000 mb level show that SO_2 from its highest emission Sudbury (Fig. 1.27.9) could have been transported.

Air trajectories for the 925 mb level show that the pollution transport at this level would have been relatively insignificant as no highest emission area was involved.

Air trajectories at the 850 mb level show that SO_2 from its highest emission Sudbury (Fig. 1.27.9), Chicago (Fig. 1.27. 11&13) and Detroit (Fig. 1.27. 12) areas could have been transported. SO_2 from the other highest emission area in Illinois could also have been carried for some short period on October 13 (see Figs. 1.27. 11-13).

Air trajectories for the 700 mb level show that SO_2 from the highest Sudbury (Fig. 1.27.9), Chicago (Fig. 1.27.12) and other area in Illinois (see Fig.1.27.11-13) for some period could have been transported.

Summarizing, as the warm front approached, precipitation fell for a long period of the time at the station. The warm front passed over and due to the close proximity of the wave, the station did not remain in the warm sector for long. Transport of SO_2 at low (1000 mb) and high level (850 mb & 700 mb) from Sudbury and at high level from Detroit, Chicago and other area in Illinois was likely. Since transport of SO_2 at low level occurred only from Sudbury at one level for short period, it is concluded that high level transport from a number of different source regions was more important.

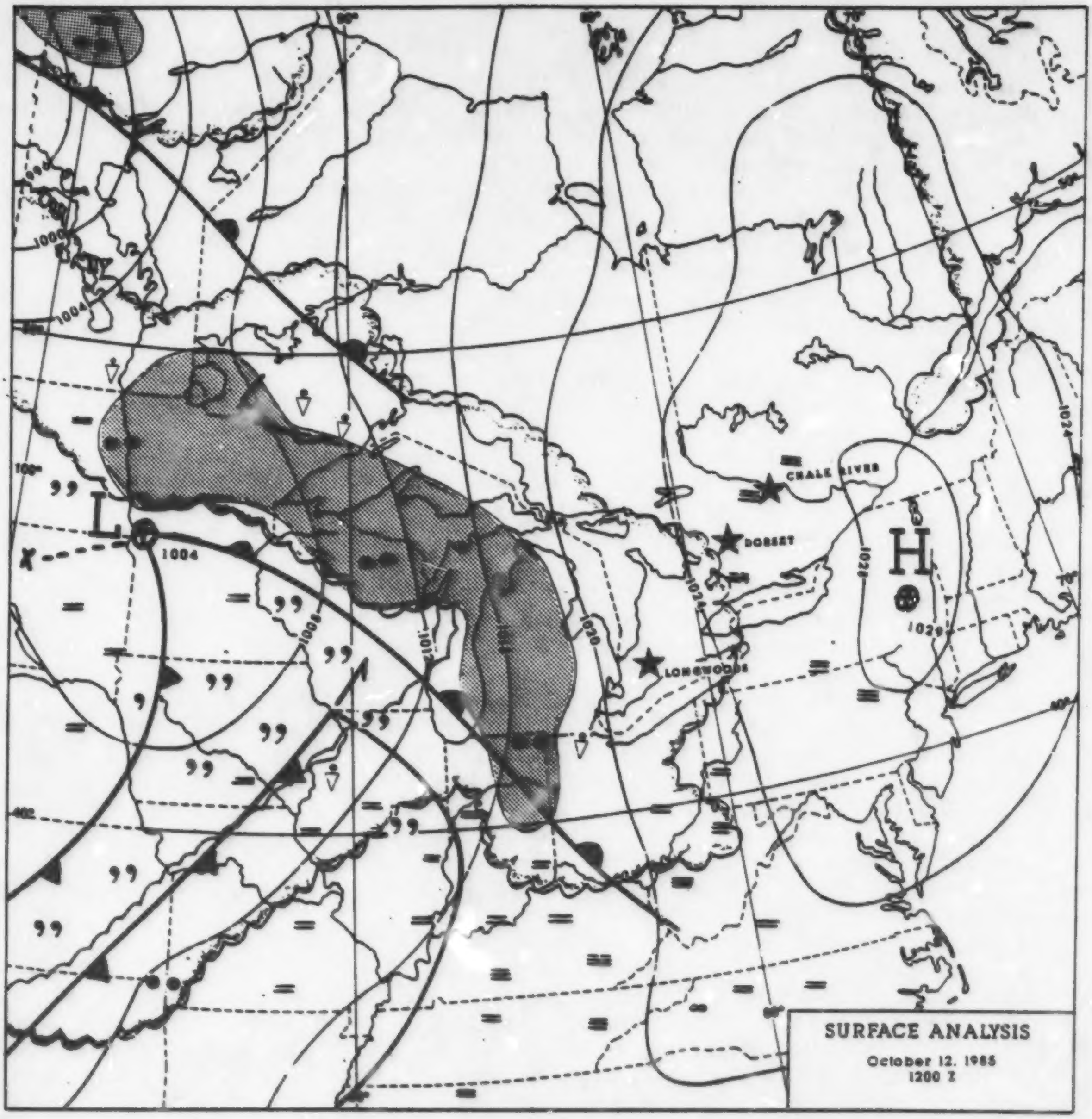

SURFACE ANALYSIS
October 12, 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
L
H
1000
1004
1008
1012
1020
1024
1028
100°
90°
80°
70°
40°

FIGURE 1.27.1

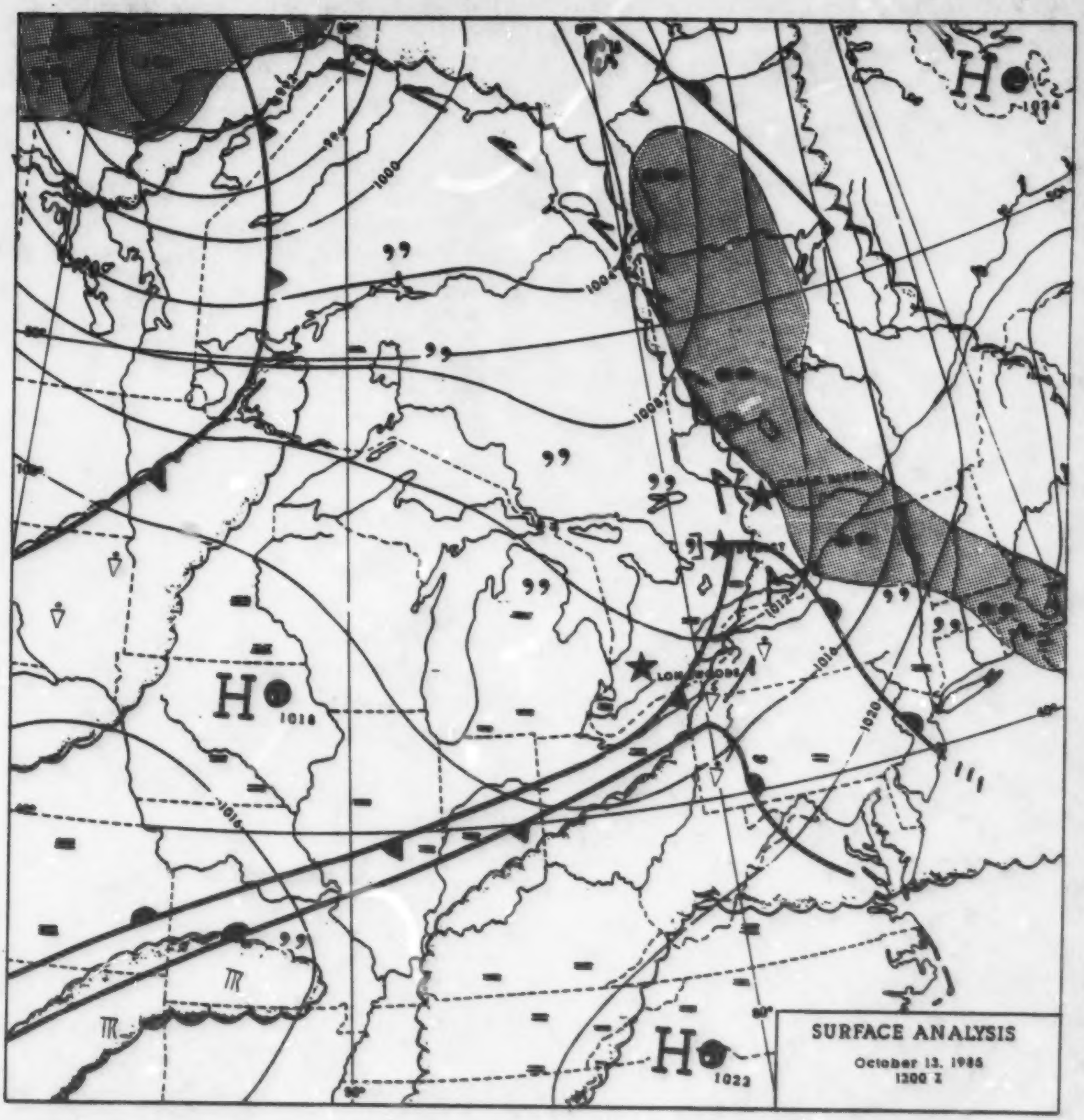
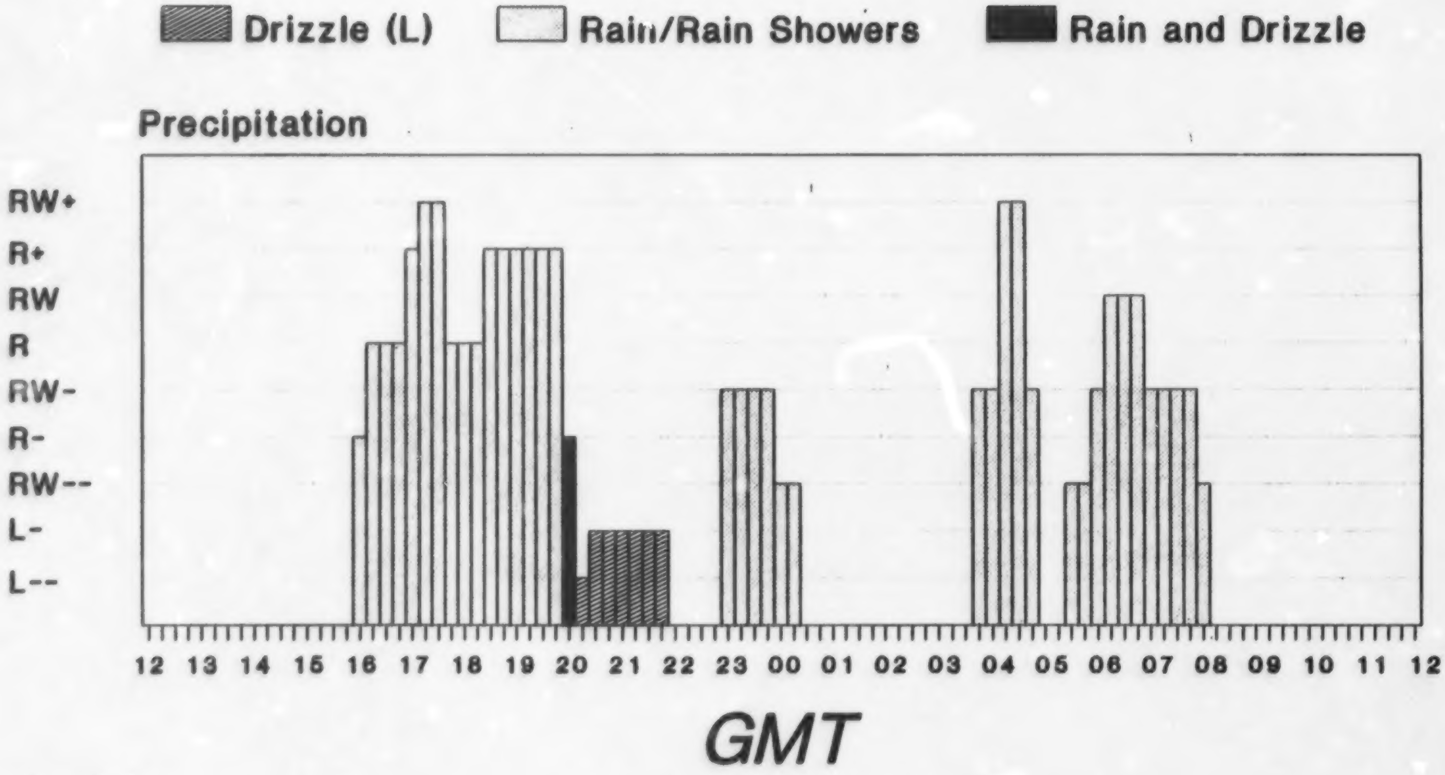

SURFACE ANALYSIS
October 13, 1985
1200 Z
H
1018
H
1022
H
1024
1000
1004
1008
1012
1016
1020
1016

FIGURE 1.27.2

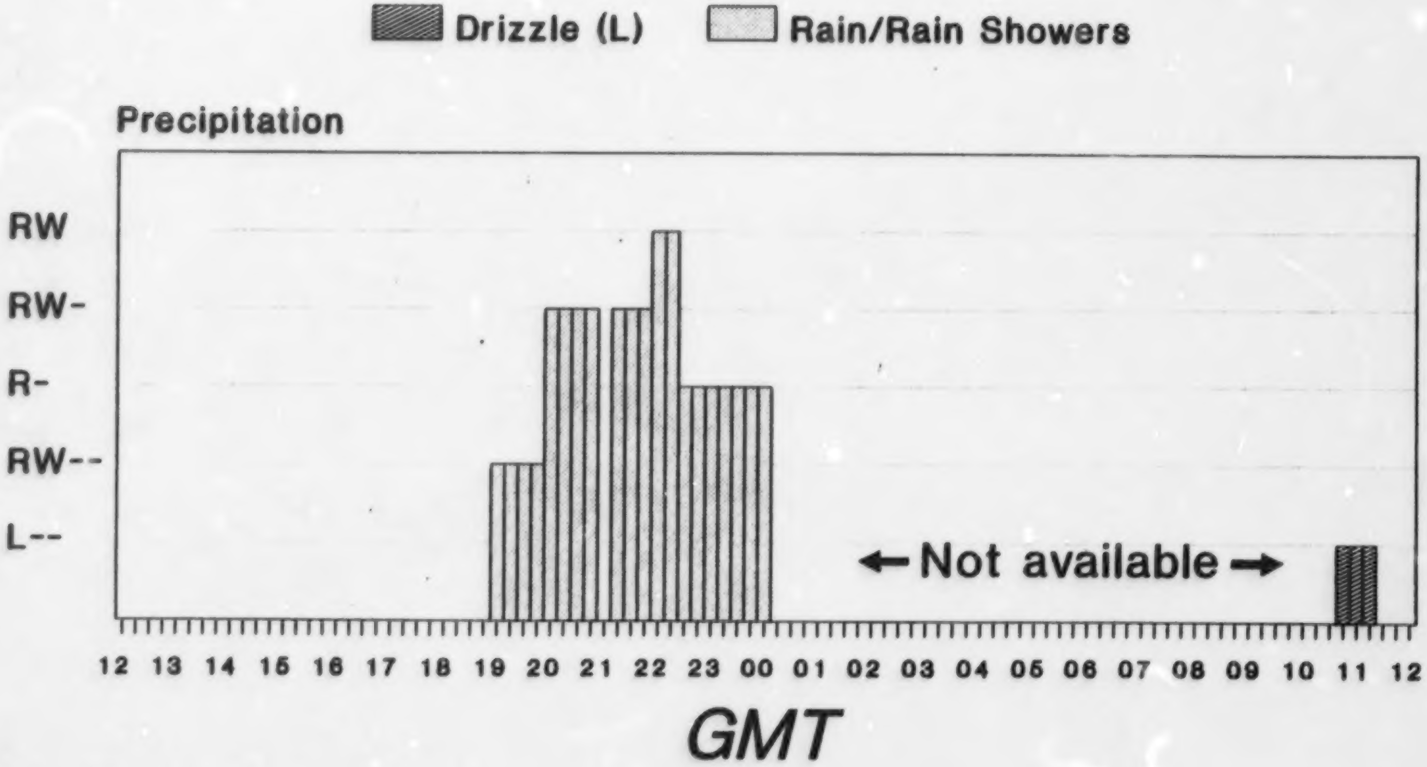
London A
Oct. 12-13, 1985



R - Rain
RW - Rain Showers

FIGURE 1.27.3A

Muskoka A
Oct. 12-13, 1985



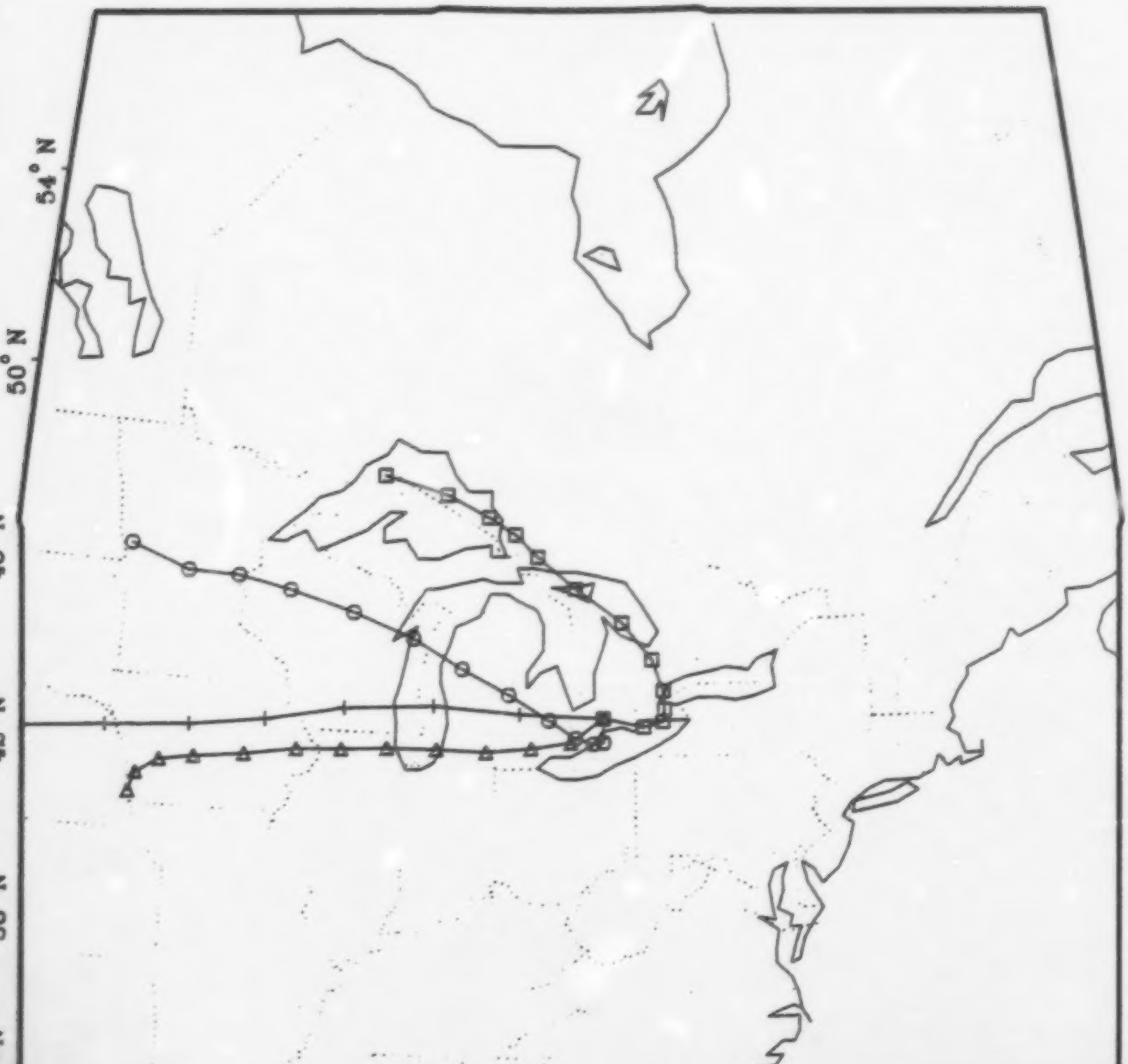
R - Rain
RW - Rain Showers

FIGURE 1.27.3B

72 HOUR TRAJECTORIES
SAT OCT12 85 12 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.4

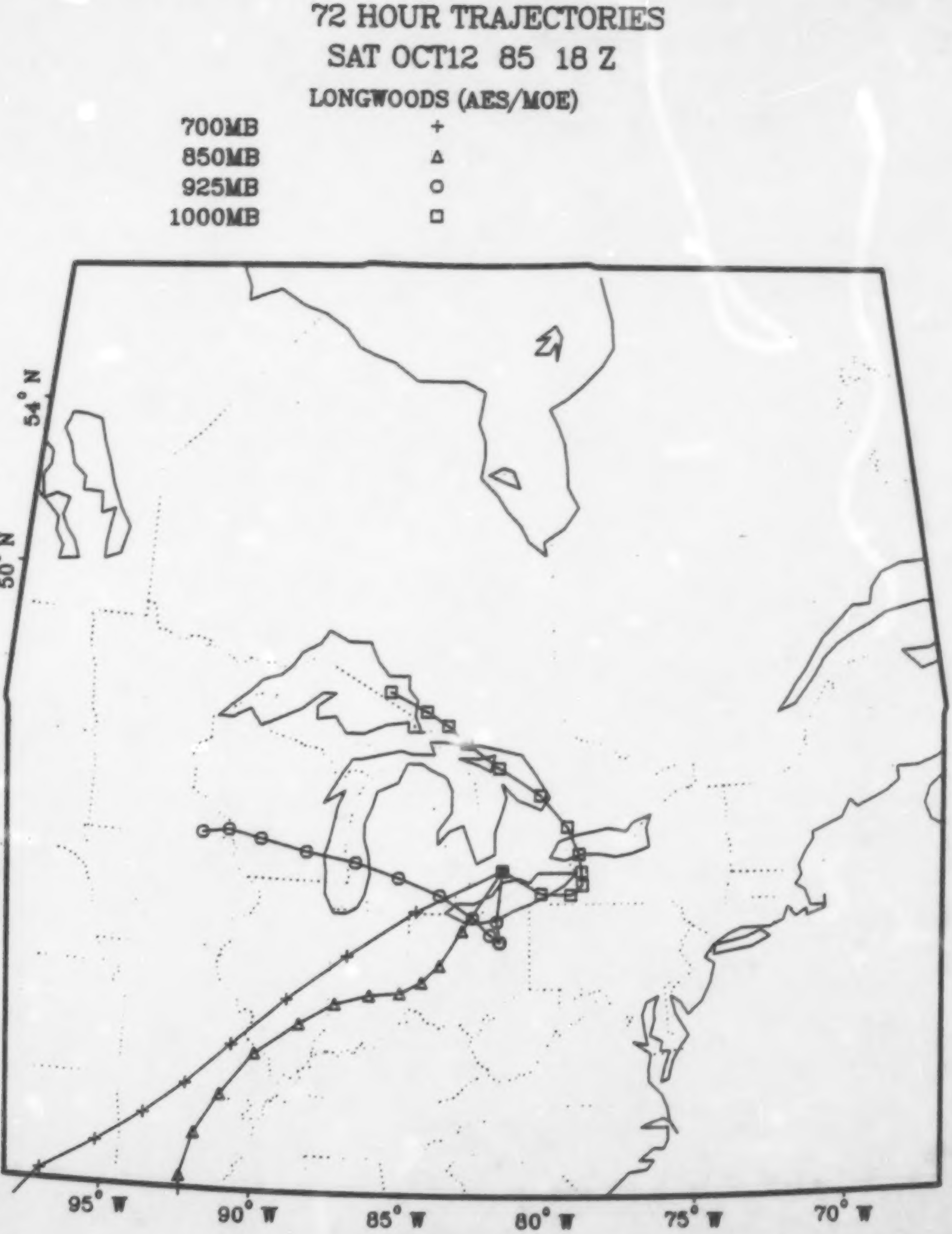

72 HOUR TRAJECTORIES
SAT OCT12 85 18 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.5

72 HOUR TRAJECTORIES
SUN OCT13 85 0 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

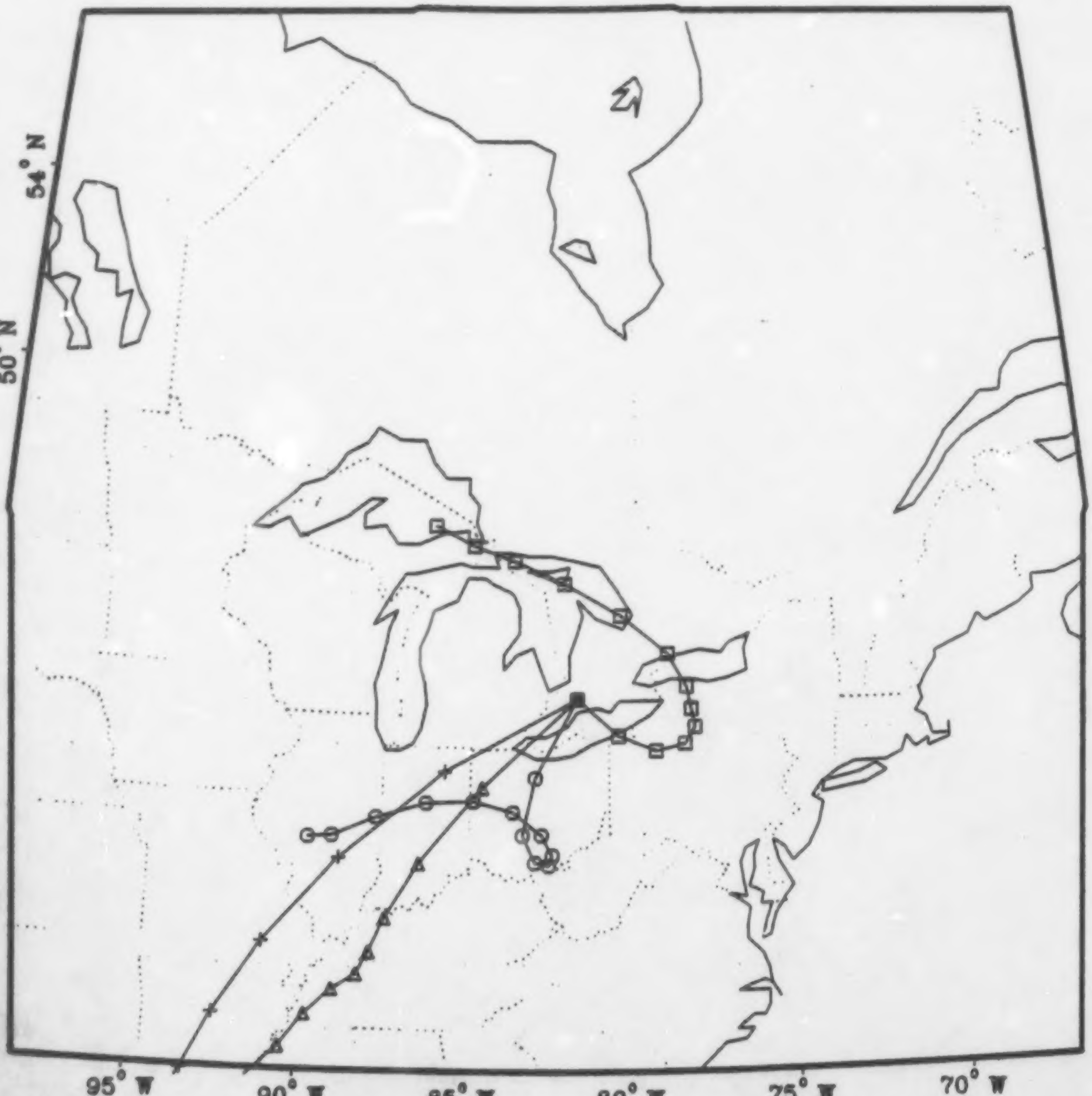

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.6

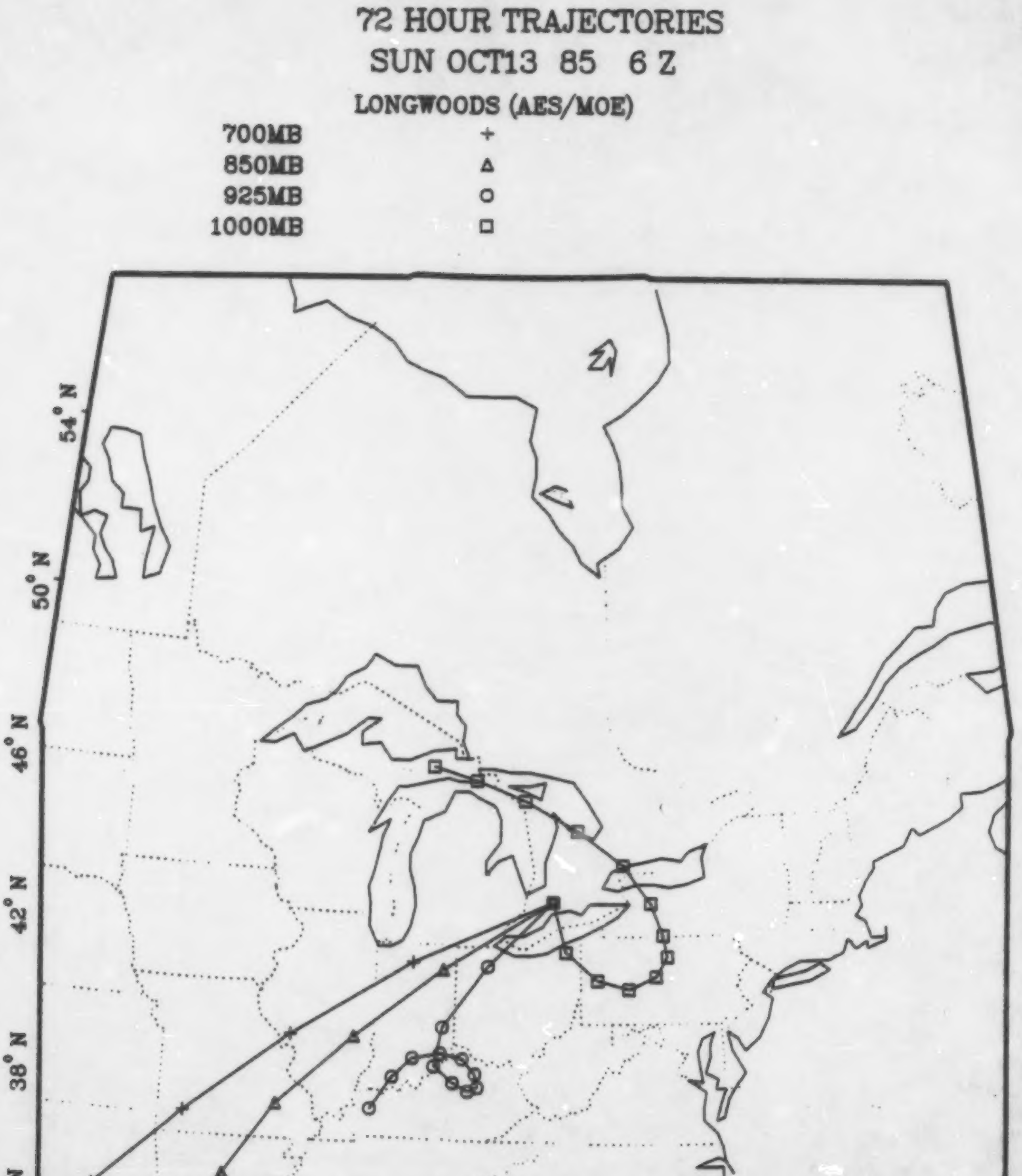

72 HOUR TRAJECTORIES
SUN OCT13 85 6 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.7

72 HOUR TRAJECTORIES
SUN OCT13 85 12 Z
LONGWOODS (AES/MOE)

700MB +
850MB △
925MB ○
1000MB □

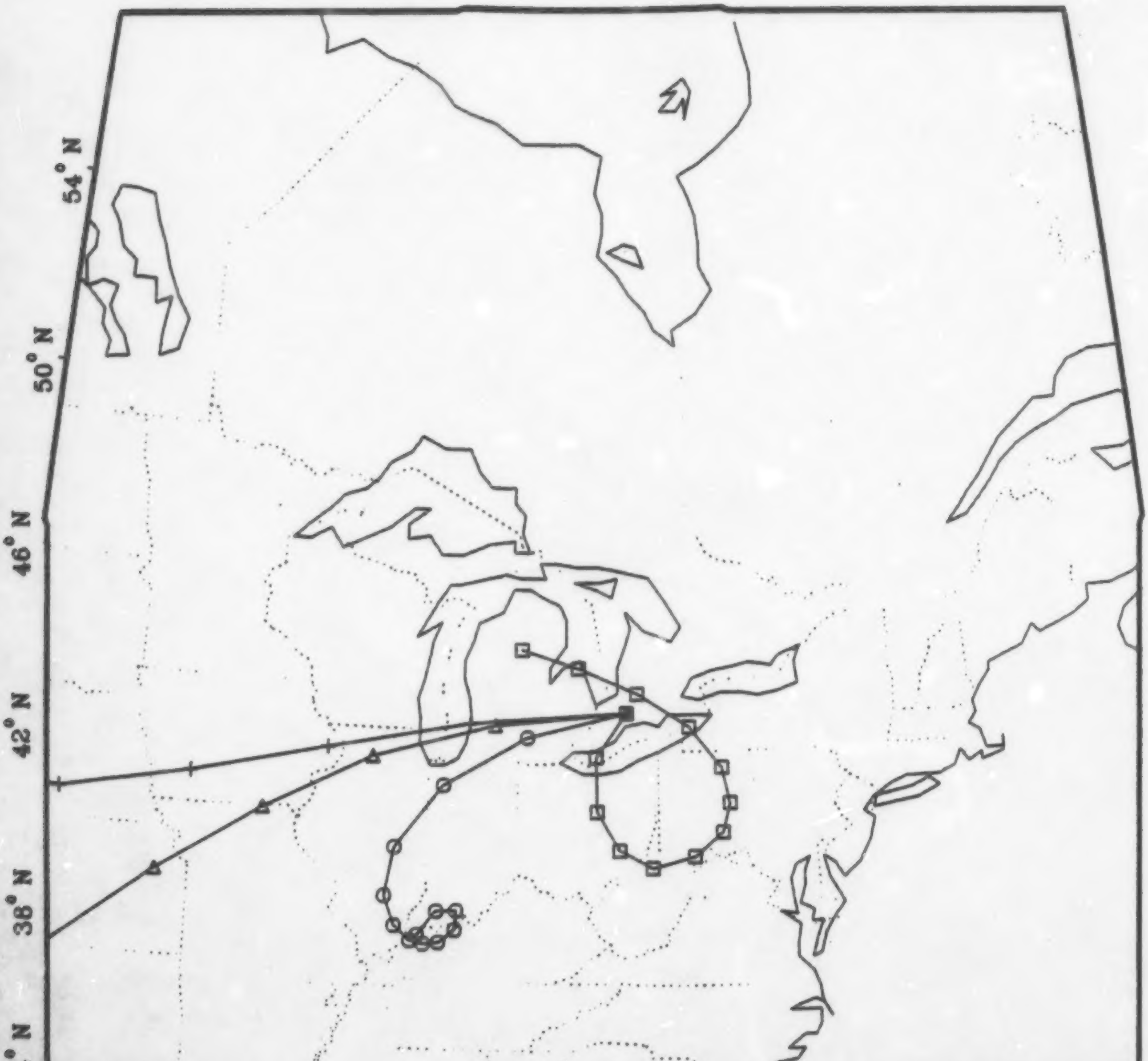

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.8

72 HOUR TRAJECTORIES
SAT OCT12 85 12 Z

DORSET (MOE)

700MB +
850MB △
925MB ○
1000MB □

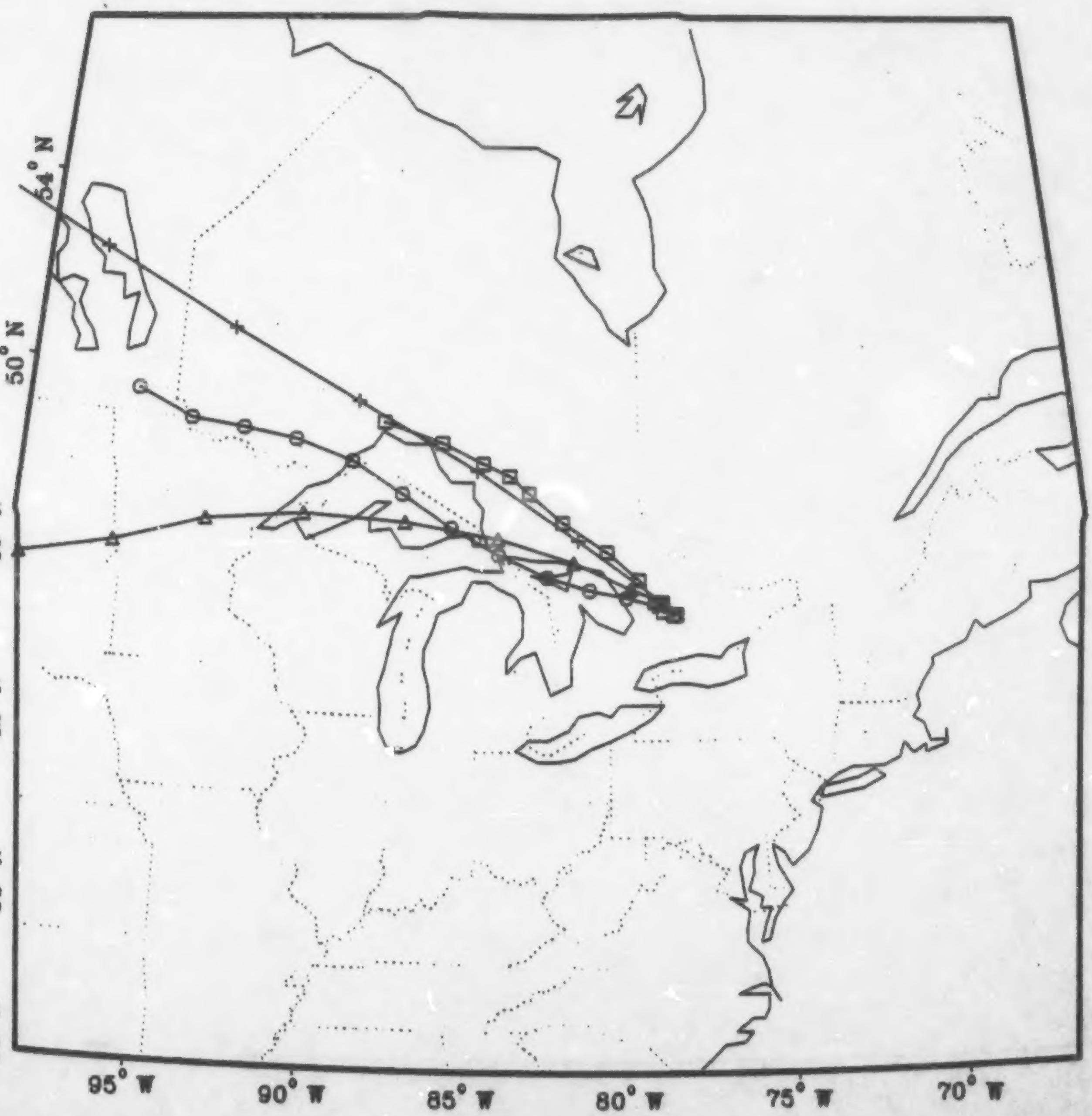

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.9

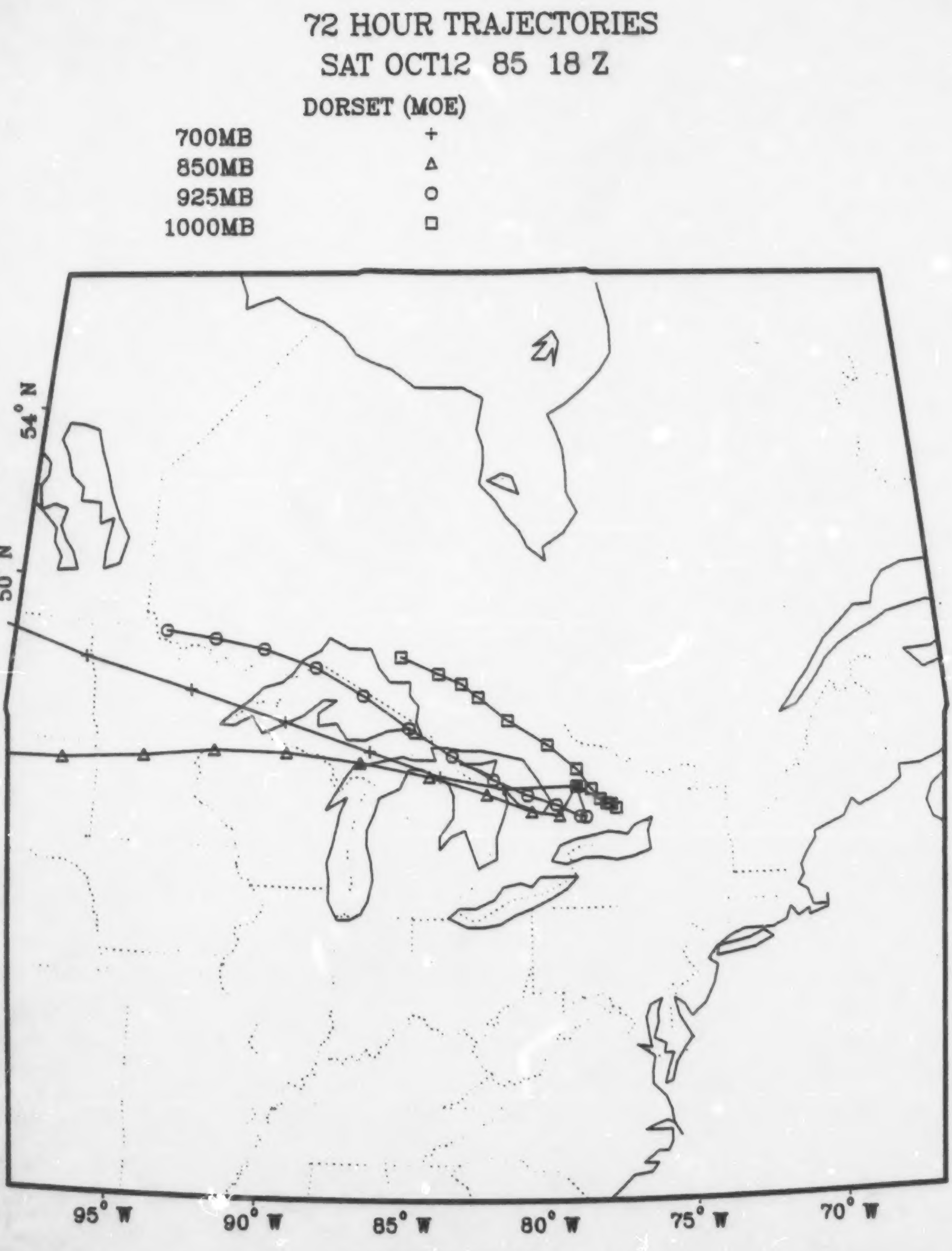

72 HOUR TRAJECTORIES
SAT OCT12 85 18 Z
DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

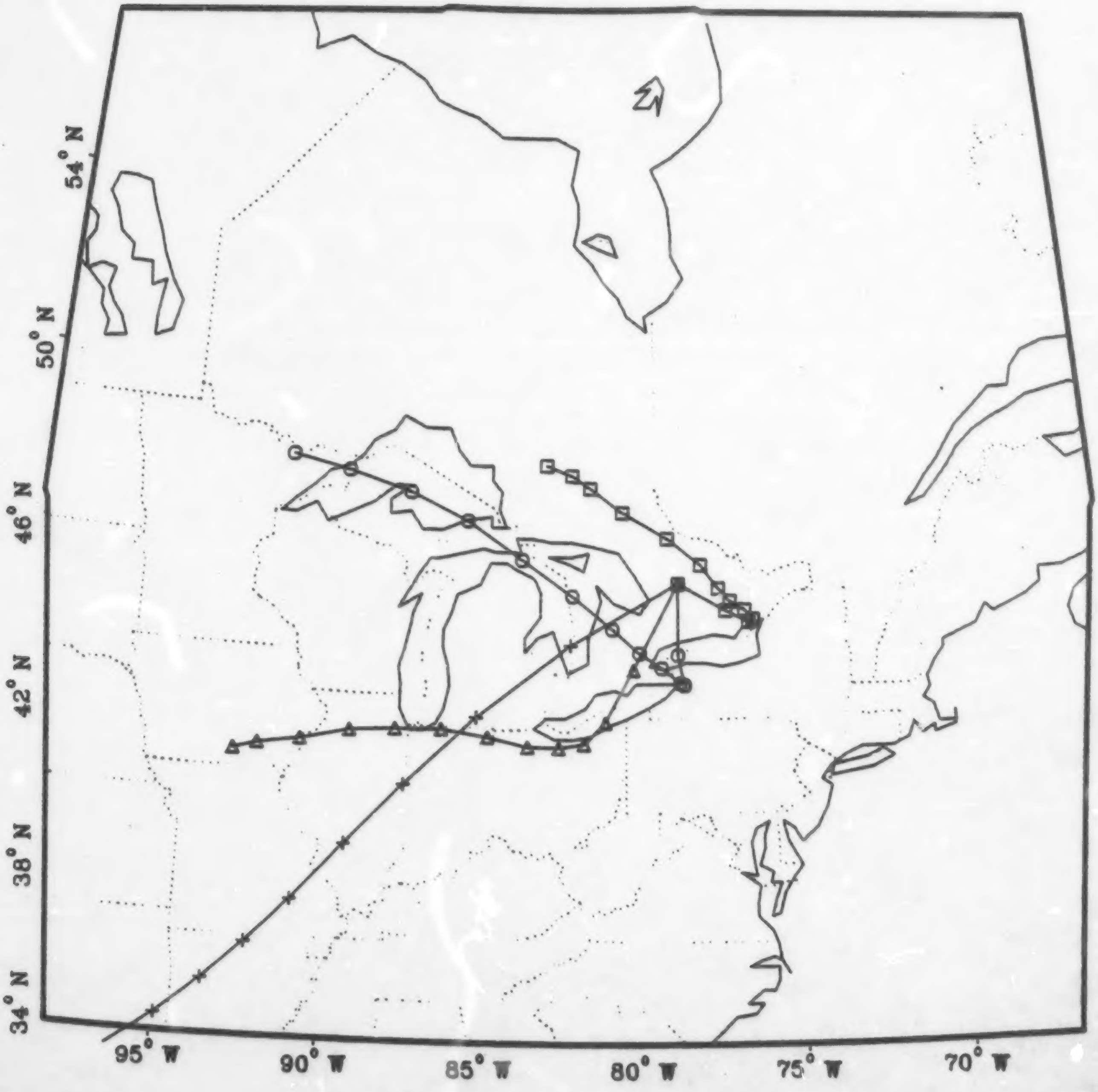
FIGURE 1.27.10

72 HOUR TRAJECTORIES

SUN OCT13 85 0 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□



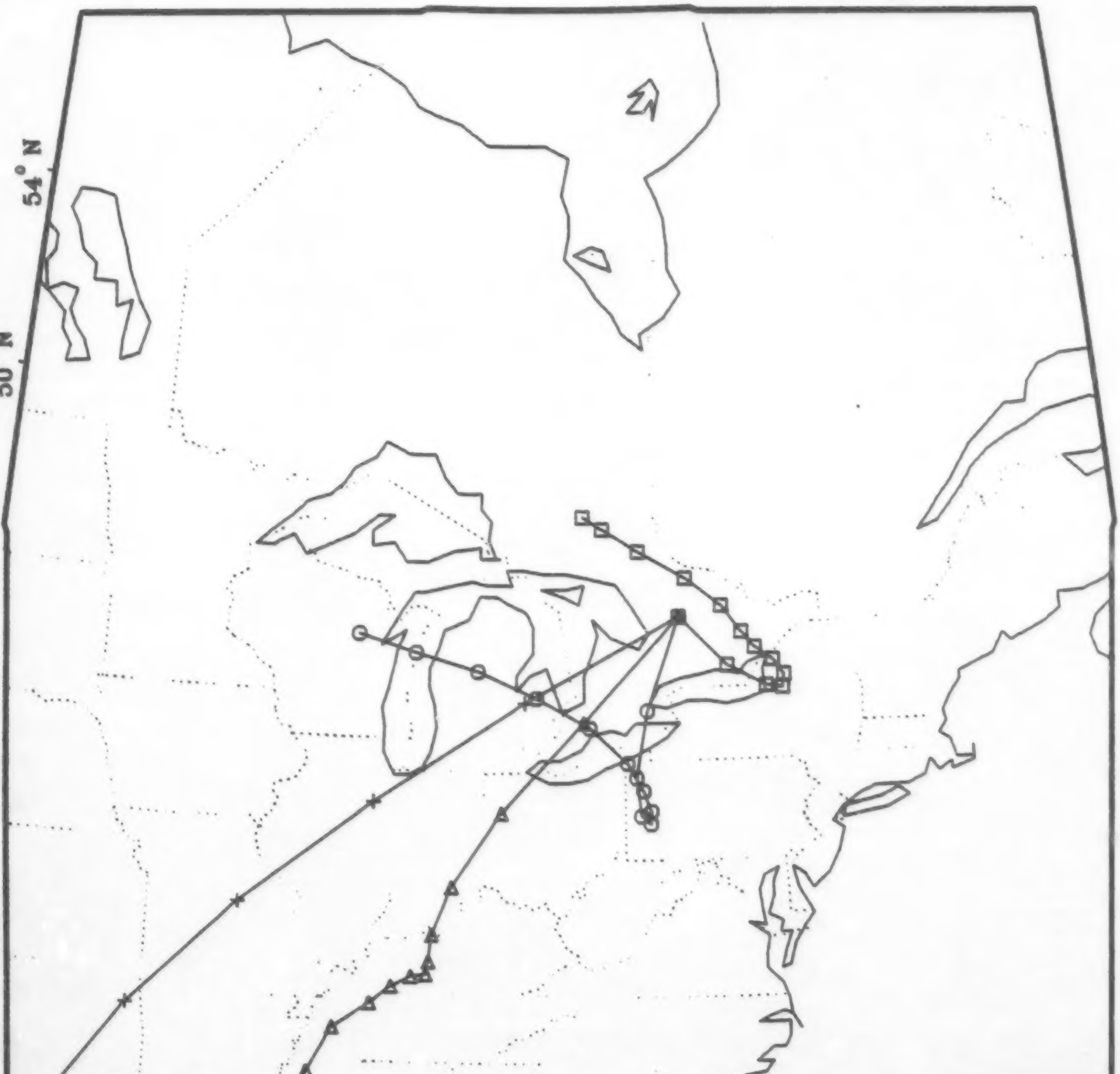
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.11

72 HOUR TRAJECTORIES
SUN OCT13 85 6 Z

DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.12

72 HOUR TRAJECTORIES
SUN OCT13 85 12 Z
DORSET (MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

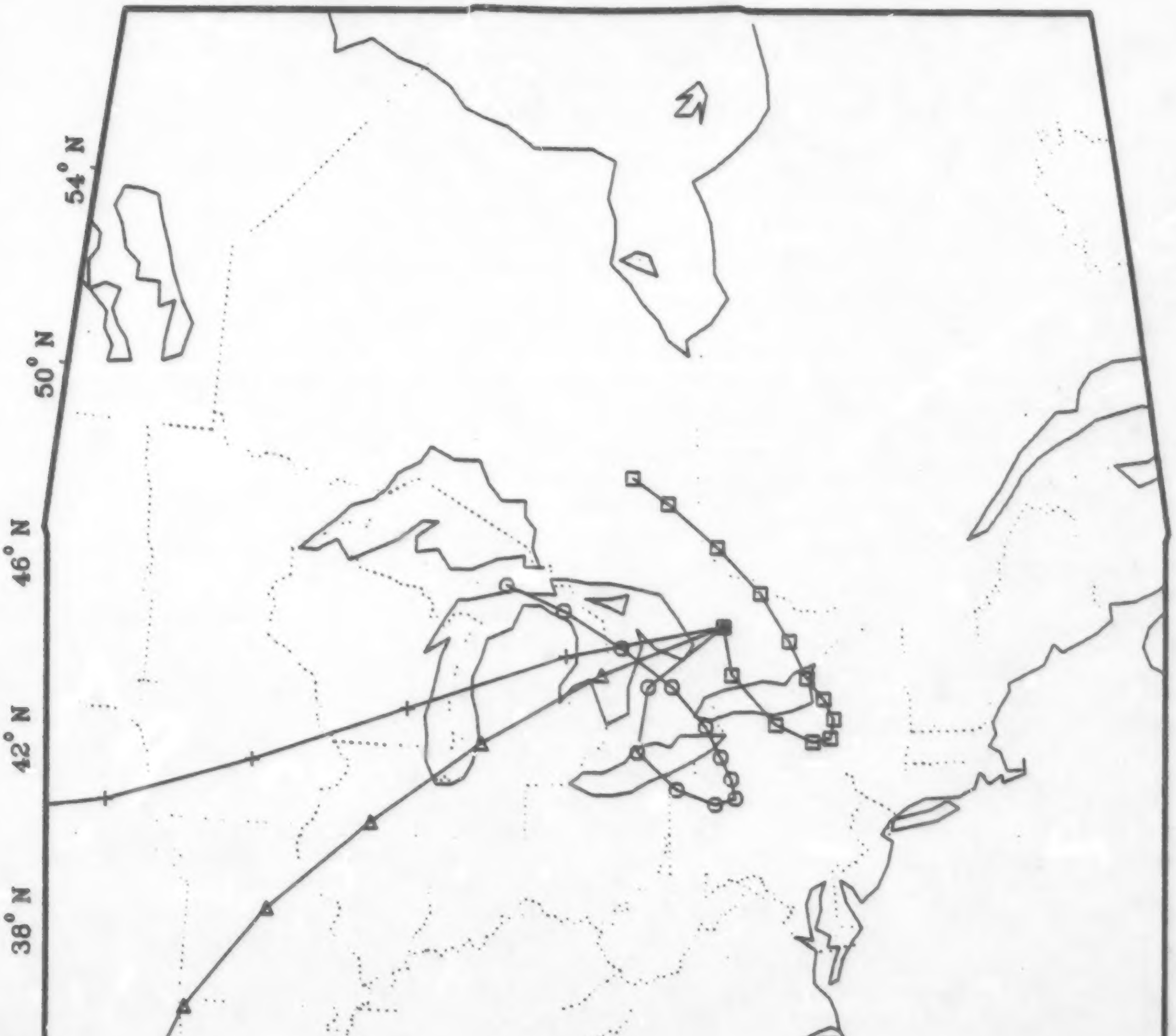

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.27.13

1.28 October 18-19, 1985. Longwoods (AES & MOE)

This episode ranked 4th (4/8) for $SO_4^=$ and 3rd (3/10) for NO_3^- wet deposition events for Longwoods (AES). For the MOE station, it ranked 3rd for $SO_4^=$ (3/8) and NO_3^- (3/10) wet deposition events.
A wave, over Lake Michigan near Green Bay, with a frontal system was analyzed on October 18, at 12Z as shown in Fig. 1.28.1. As exhibited in the figure, another northern front associated with a low over James Bay near Moosonee was also observed but it did not affect the weather at Longwoods. The wave moved eastward and the warm front first passed over the station on Oct. 18 and the station remained in the warm sector since the cold front remained over Lake Huron north of Longwoods until October 19 morning hours. The cold front had dipped south of the station, as shown in Fig. 1.28.2, on Oct. 19 at 12Z, and the wave was over eastern Quebec near the border with New Hampshire and Vermont. The continuous precipitation area associated with the system, as shown in fig. 1.28.1, increased in size picking up moisture from the Great Lakes as it moved over Ontario and Longwoods remained in it for almost 16-17 hours as illustrated in Fig. 1.28.3. Initial very light and light rain showers were followed by rain with heavy rain recorded for three hours as shown in the figure. The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for October 18, at 12Z, 18Z and October 19, at 00Z, 06Z and 12Z are shown in Figures 1.27.4, 1.27.5, 1.27.6, 1.27.7 and 1.27.8 respectively.
Air trajectories for the 1000 mb level show that SO_2 from its highest emission Chicago (Fig. 1.28.4), Detroit (Fig. 1.28.7-8), and Pennsylvania-Ohio-West Virginia states (Fig. 1.28.5-8), and NO_x from its highest emission Chicago and high emission Detroit, Pennsylvania-Ohio-West Virginia areas could have been transported.
Air parcels arriving at the 925 mb level could have transported SO_2 and NO_x from their respective highest and high emission Detroit (Fig. 1.28.4-5), West Virginia-Ohio (Fig. 1.28.4&7) areas. Transport of these pollutant from their highest emission Chicago area was also likely at the end as shown in Fig. 1.28.8.
Air parcels arriving at the 850 mb level could have carried SO_2 from its highest emission area in Illinois (Fig. 1.28.5-8) and SO_2 and NO_x from Chicago area (fig. 1.28.8).
Air trajectories for the 700 mb level show that SO_2 and NO_x from their highest emission Chicago area could have been carried over throughout the episode as shown in Figs. 1.28.4-8.
In summary, a warm and cold front passed over the station such that it remained mostly in the warm sector and rain showers and rain occurred for about 17 hrs with heavy rain for about three hours. High level transport (850 mb & 700 mb) of SO_2 and NO_x from Chicago and other area in Illinois for most of the period and low level transport from Chicago for a short duration was likely. Low level transport from Detroit, Michigan and Pennsylvania-Ohio-West Virginia also was probable.

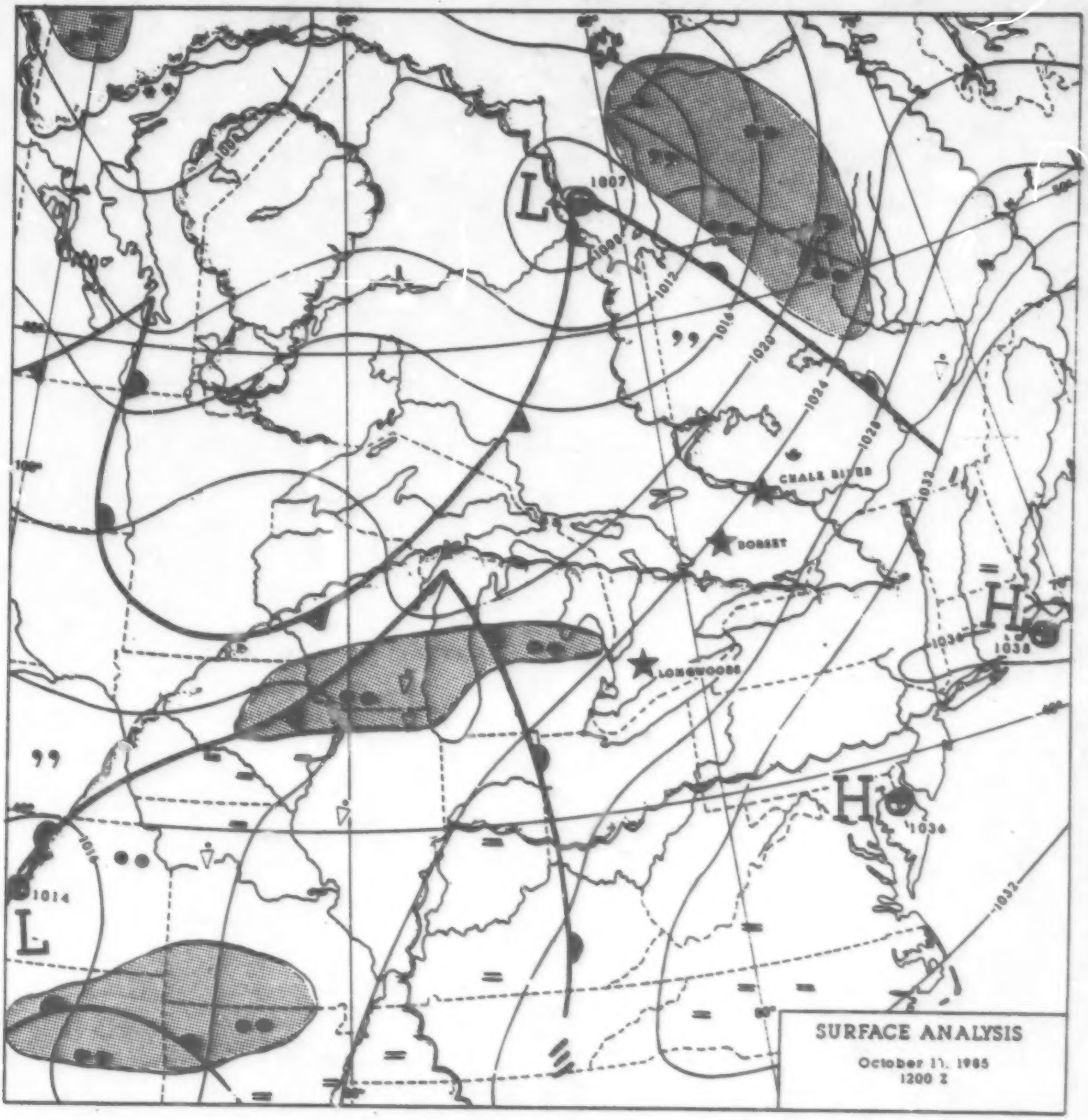

SURFACE ANALYSIS
October 11, 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
L
L
H
H
1007
1008
1012
1016
1020
1024
1028
1032
1036
1038
1036
1032
1014
1014

FIGURE 1.28.1

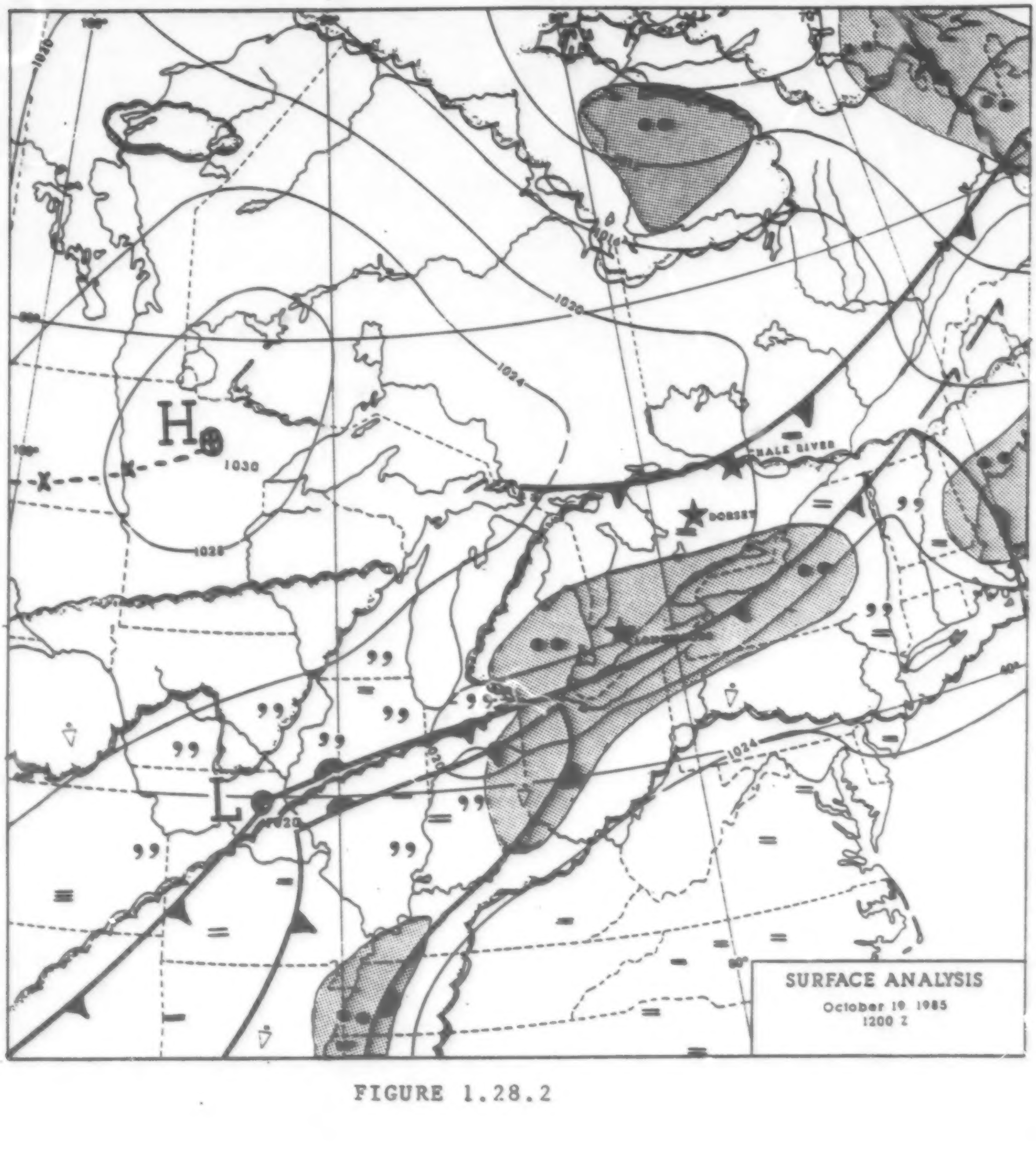
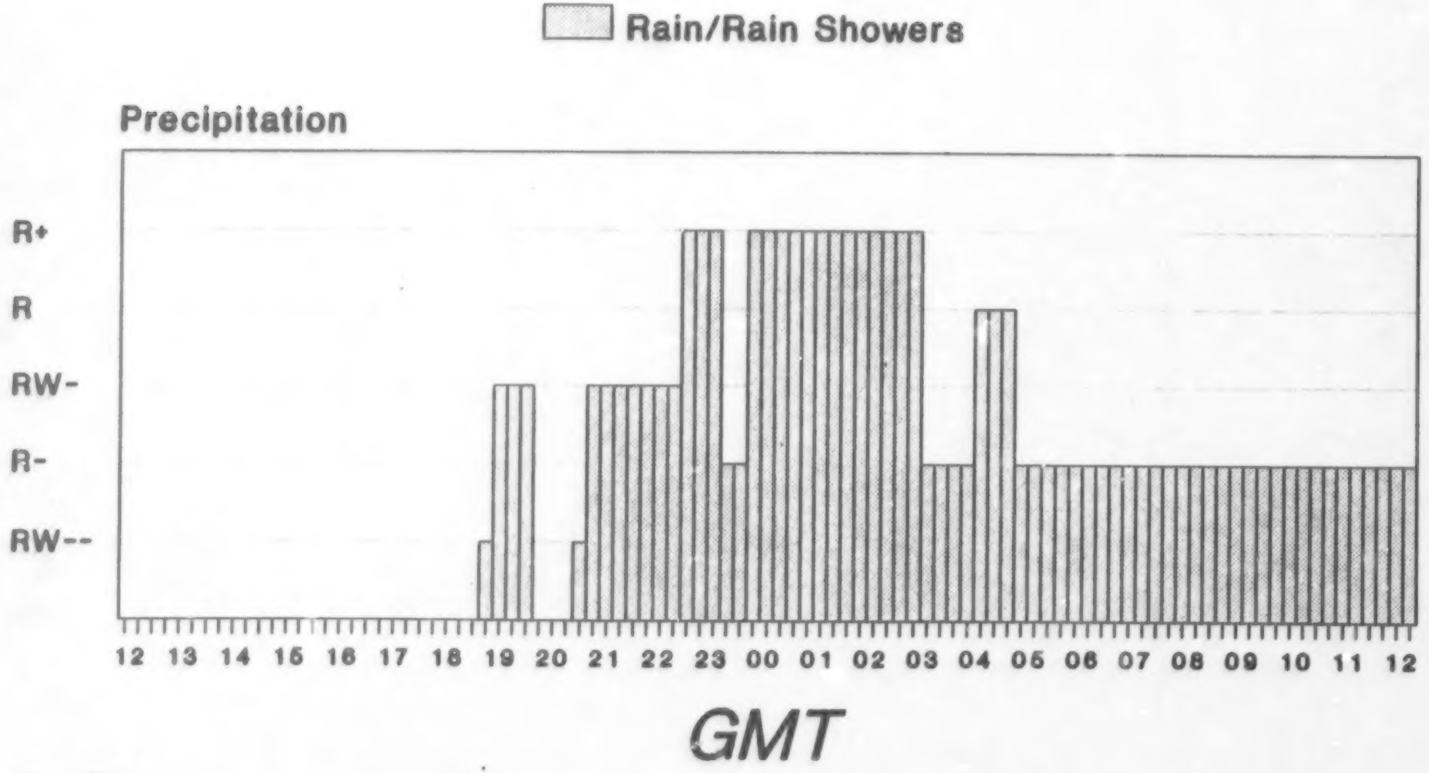

SURFACE ANALYSIS
October 19 1985
1200 Z
H
L
1030
1028
1024
1020
1016
CHALK RIVER
DORSET

FIGURE 1.28.2

London A
Oct. 18-19, 1985



R - Rain
RW - Rain Showers

FIGURE 1.28.3

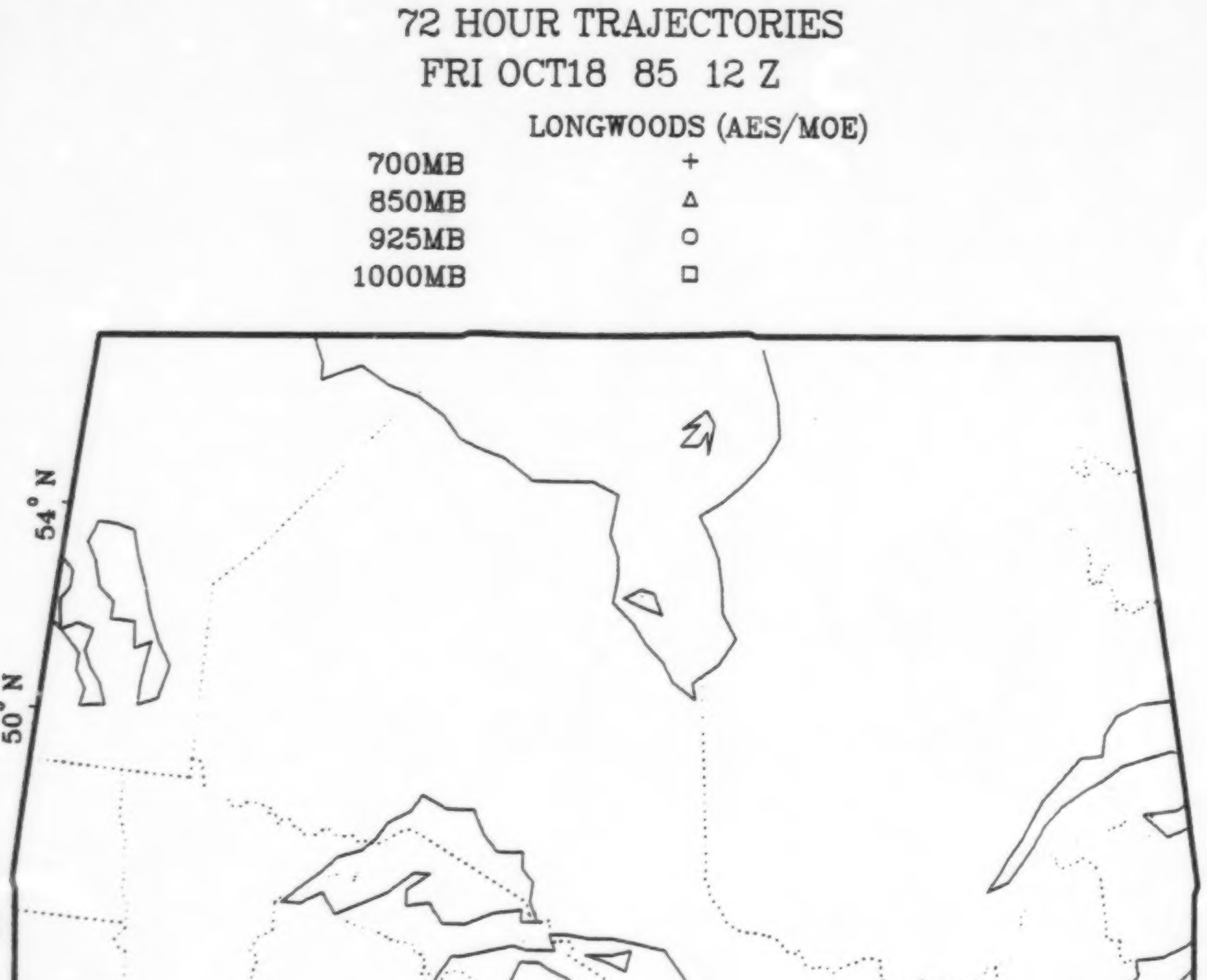
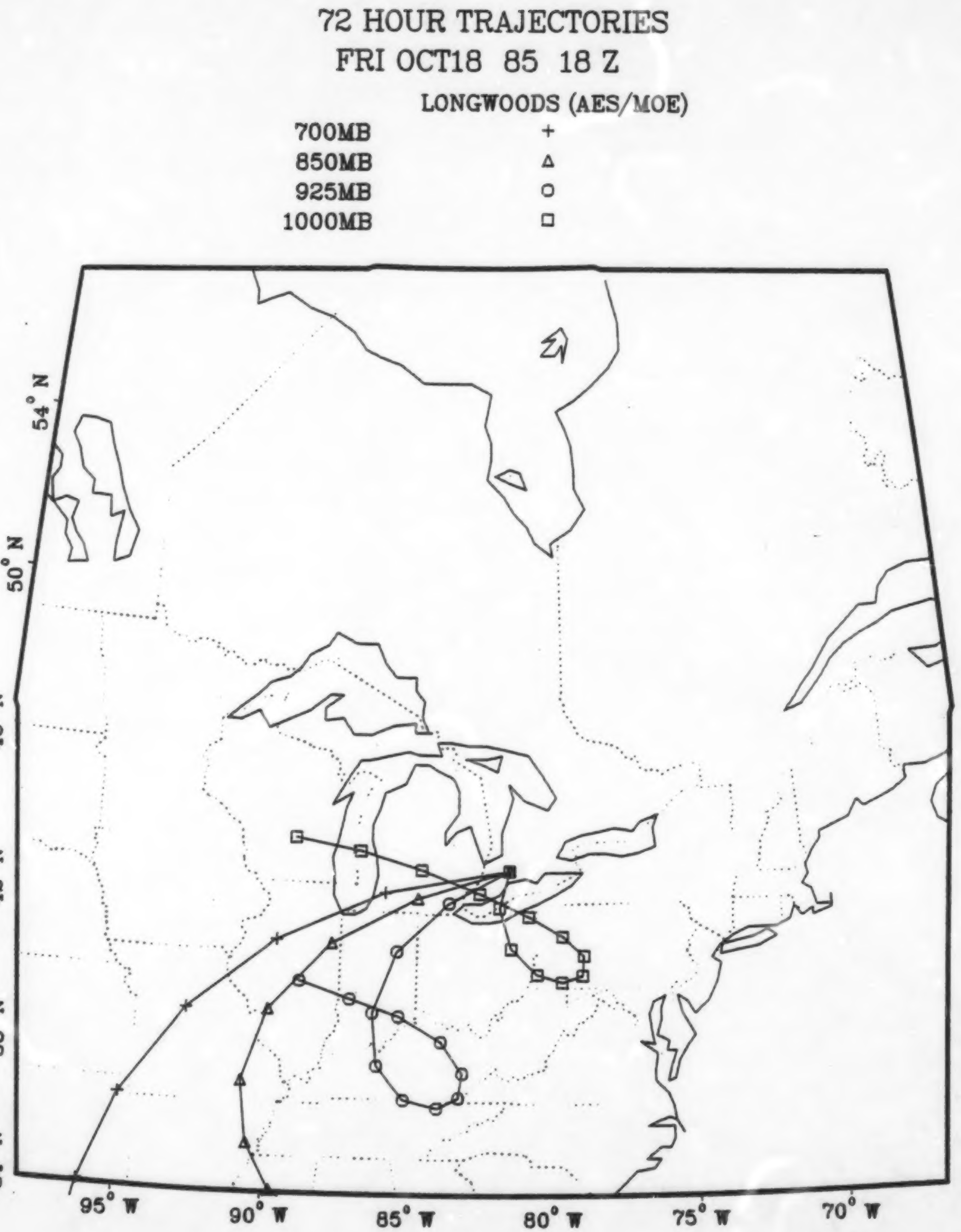

72 HOUR TRAJECTORIES
FRI OCT18 85 12 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.28.4



72 HOUR TRAJECTORIES
FRI OCT18 85 18 Z

LONGWOODS (AES/MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.28.5

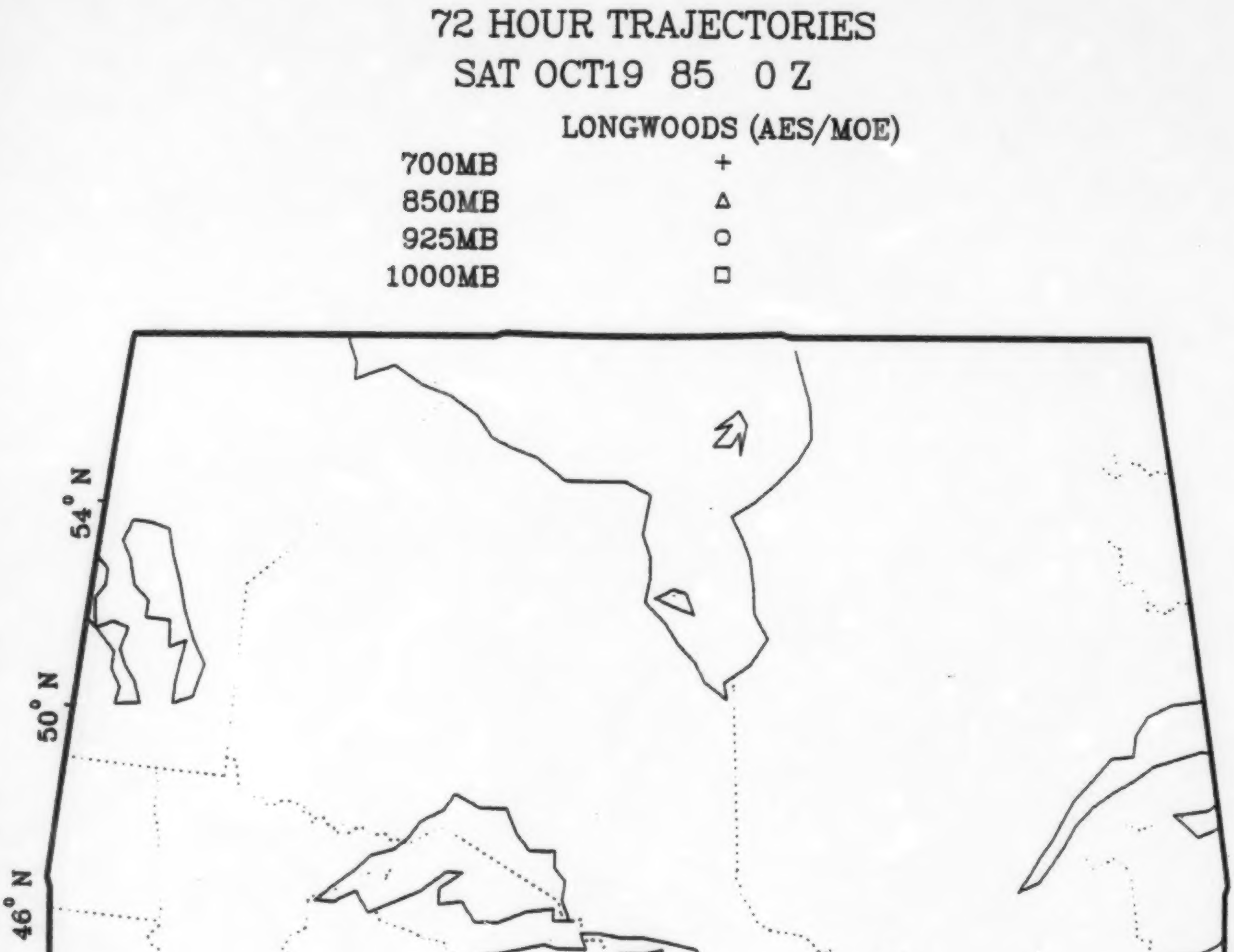

72 HOUR TRAJECTORIES
SAT OCT19 85 0 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.28.6

72 HOUR TRAJECTORIES
SAT OCT19 85 6 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

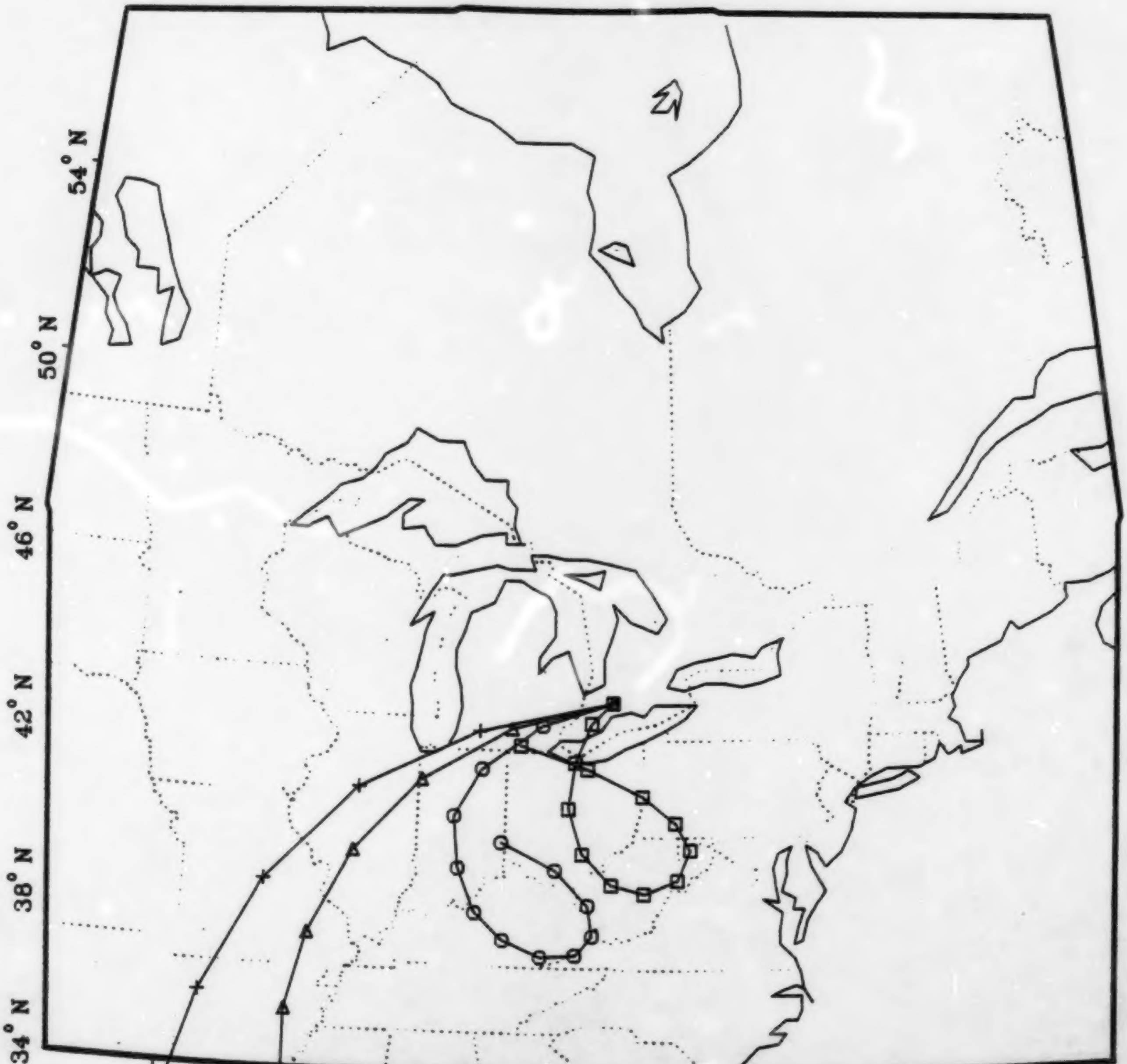

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.28.7

72 HOUR TRAJECTORIES
SAT OCT19 85 12 Z

LONGWOODS (AES/MOE)

700MB	+
850MB	△
925MB	○
1000MB	□

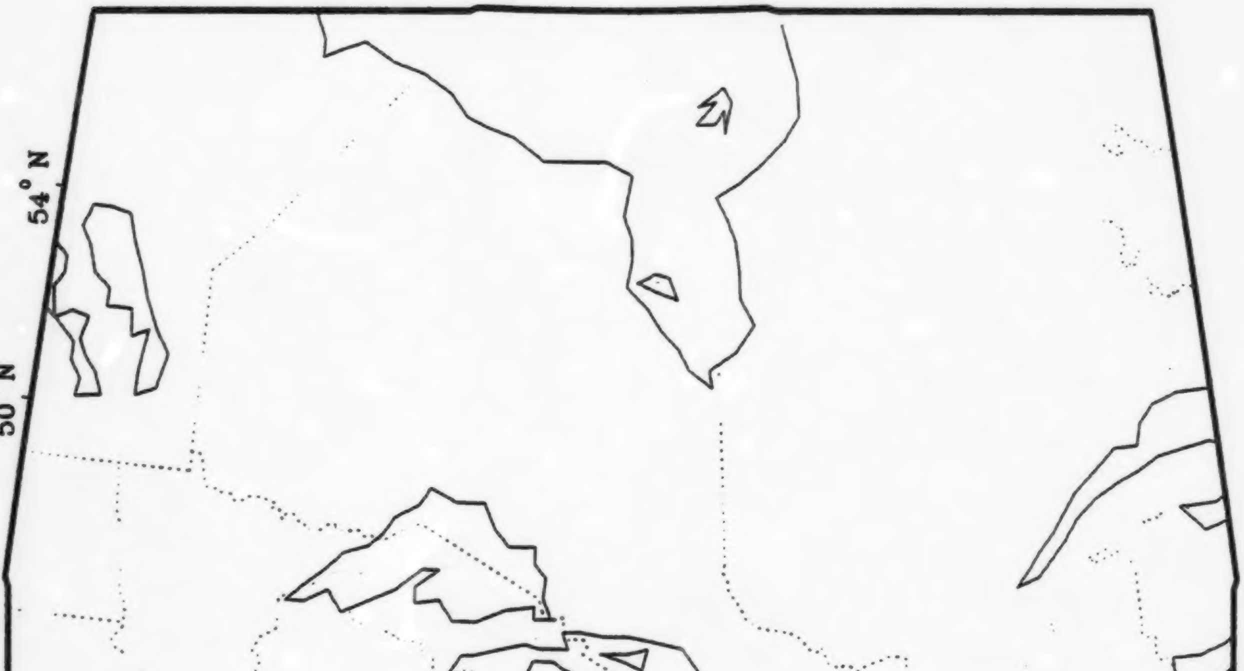

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.28.8

1.29 November 9-10, 1985, Longwoods (AES & MOE)

This episode was ranked 4th (4/10) in the list of top 25% wet deposition events for NO_3^- for Longwoods (AES). It was not included in the top 25% $SO_4^=$ deposition events.

A quasi stationary front over the southwestern Ontario and an associated large continuous precipitation area were observed on November 9, at 12Z as shown in Fig. 1.29.1. During the entire duration of the episode, a front was analyzed in the southwestern Ontario. On Nov. 10, at 06Z, a warm front was observed just south of the station, with a low near Indiana-Ohio-Michigan border as exhibited in Fig. 1.29.2. The synoptic map for Nov. 10, 12Z, was not available and therefore synoptic conditions at 06Z are presented in Fig. 1.29.2. The continuous precipitation area moved over Longwoods area shortly after 12Z on Nov. 9, and as illustrated in Fig. 1.29.3, initially light rain showers were recorded. These were followed by rain with moderate intensity at times and at the end of the episode rain mixed with drizzle and drizzle were observed as shown in the figure.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for November 9, at 12Z, 18Z and November 10, at 00Z, 06Z and 12Z are shown in Figures 1.29.4, 1.29.5, 1.29.6, 1.29.7 and 1.29.8 respectively.

Air trajectories for the 1000 mb level show that NO_x from its highest emission Chicago area could have been transported on Nov. 9, at 12Z as shown in Fig. 1.29.4. Transport of NO_x from its high emission area in Ohio-West virginia (Fig. 1.29.6-7) and Detroit, Michigan (Fig. 1.29.5&8) was also likely.

Air parcels arriving at the 925 mb level show that NO_x from high emission areas in Ohio-West Virginia (Fig. 1.29.6-7) and Detroit (Fig. 1.29.4&8) could have been transported.

Air trajectories for the 850 mb level show that NO_x from its high emission Detroit area (Fig. 1.29.4-7) could have been transported.

Air trajectories for the 700 mb level show that NO_x from possibly the highest emission Chicago area for some time (Fig. 1.29.8) and from high emission St. Louis area (Fig. 1.29.5&7) could have been transported at this level.

In summary, a quasi-stationary front hovered around the area yielding rain showers, rain and drizzle for almost 22 hours. Transport of NO_x at low (1000 mb) and high (700 mb) level from the highest emission Chicago area and from a number of high emission areas, viz., Detroit, Michigan, St. Louis, Missouri region and Ohio and West Virginia was likely.

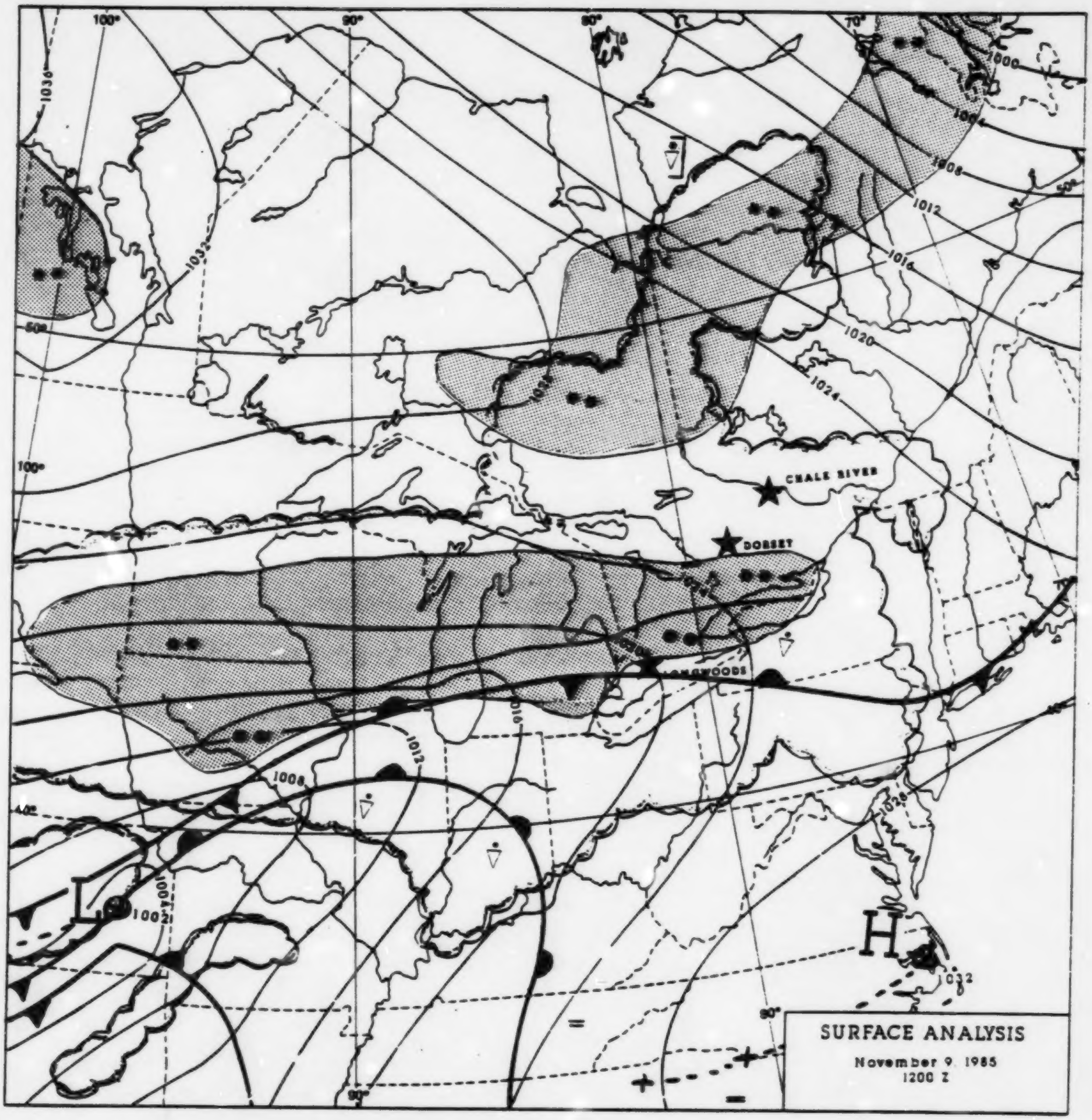

SURFACE ANALYSIS
November 9, 1985
1200 Z
CHALK RIVER
DORSET
LONGWOODS
L
H
1002
1004
1008
1012
1016
1020
1024
1028
1032
1036
1000
100°
90°
80°
70°
50°
40°

FIGURE 1.29.1

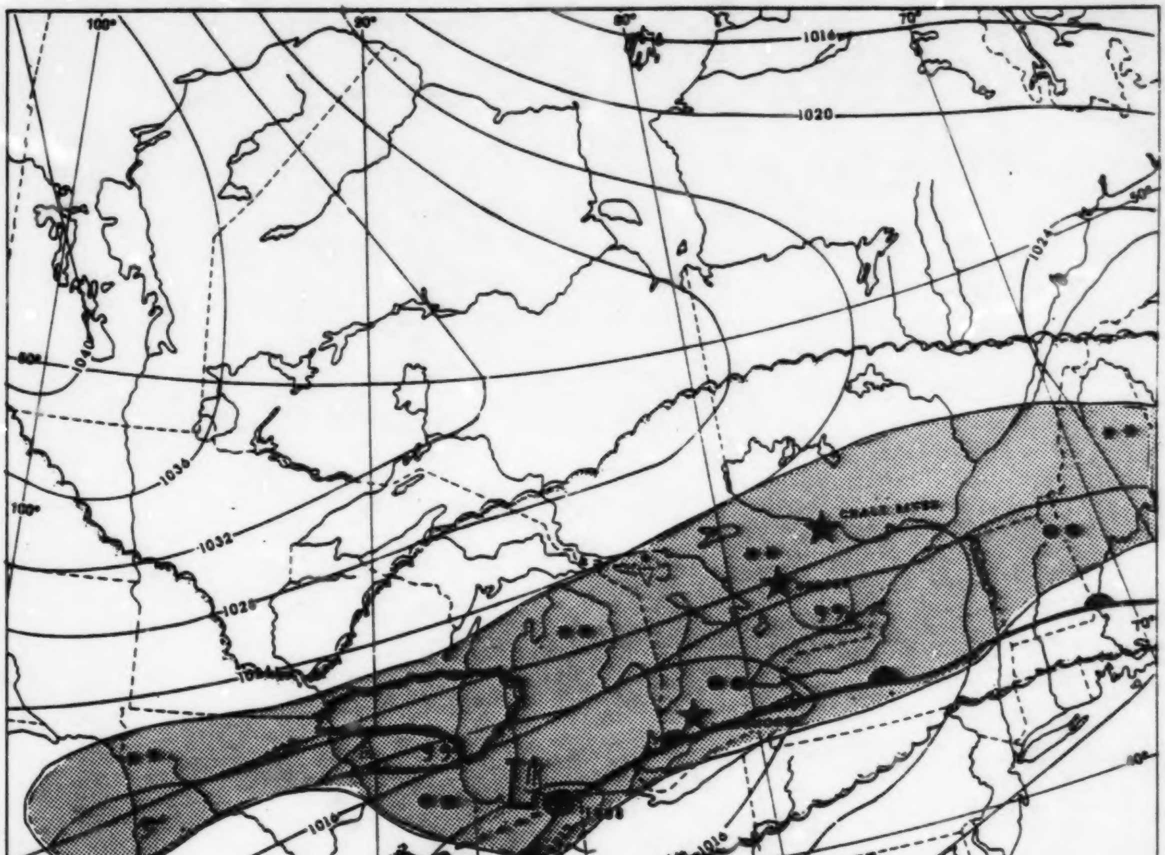
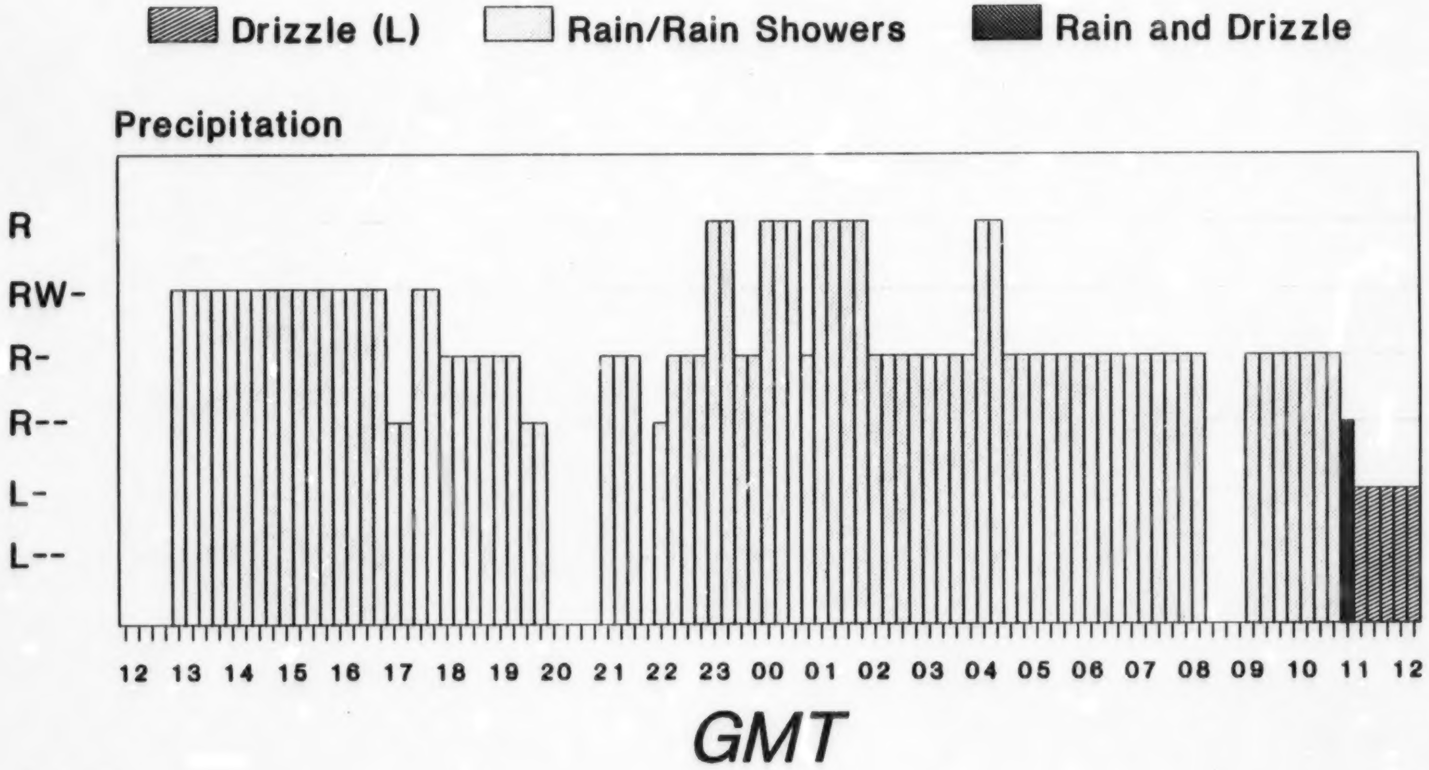

SURFACE ANALYSIS
November 10, 1985
0600 Z
CHALK RIVER
100°
90°
80°
70°
60°
50°
40°
1016
1020
1024
1028
1032
1036
1040
1012
1010
L
L

FIGURE 1.29.2

London A
Nov. 9-10, 1985



R - Rain
RW - Rain Showers

FIGURE 1.29.3

72 HOUR TRAJECTORIES
SAT NOV 9 85 12 Z

	LONGWOODS (AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

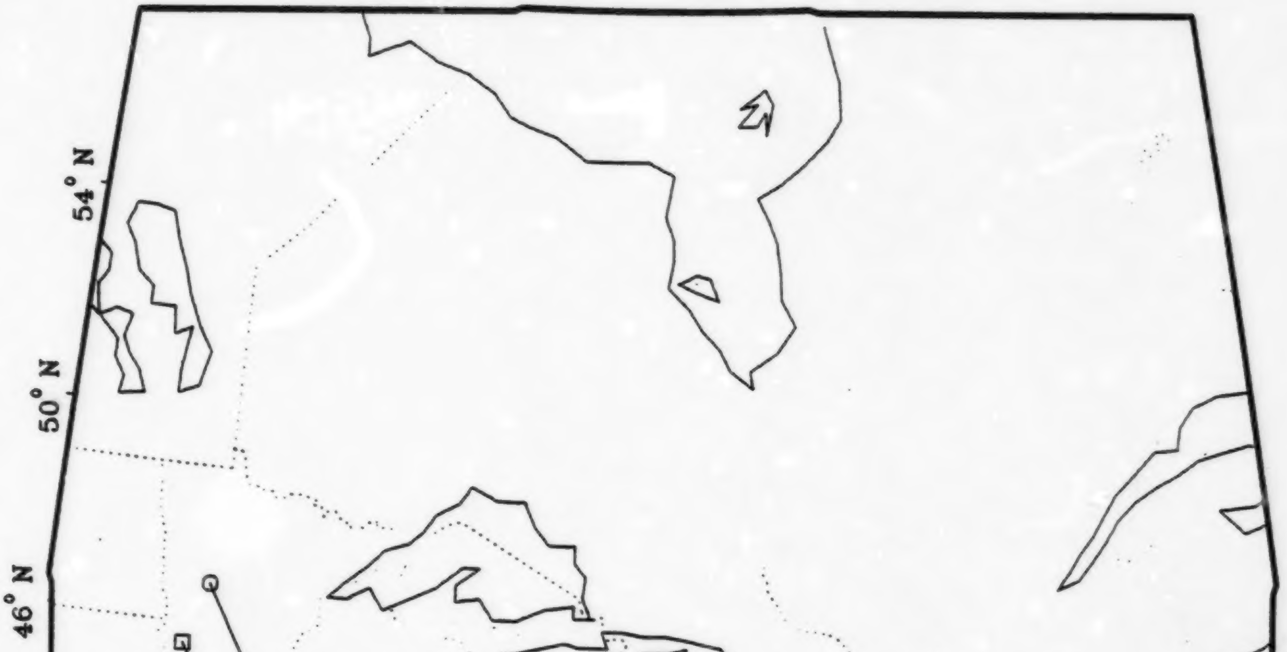

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.29.4

72 HOUR TRAJECTORIES
SAT NOV 9 85 18 Z

	LONGWOODS (AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

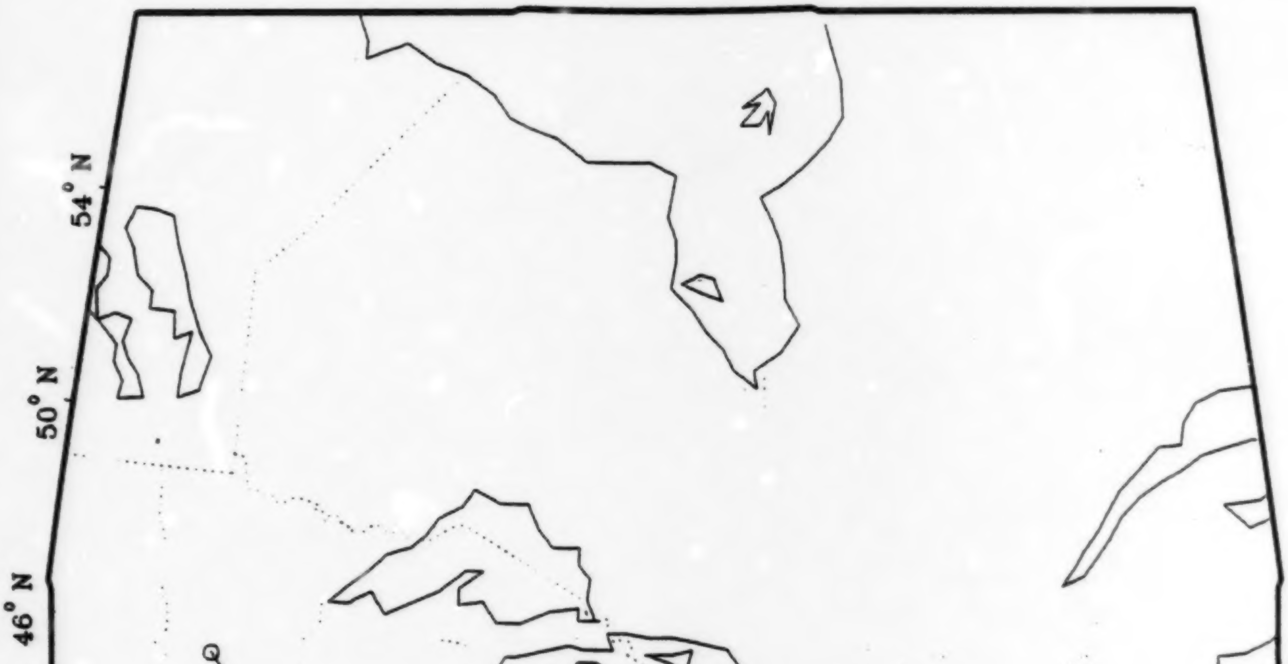
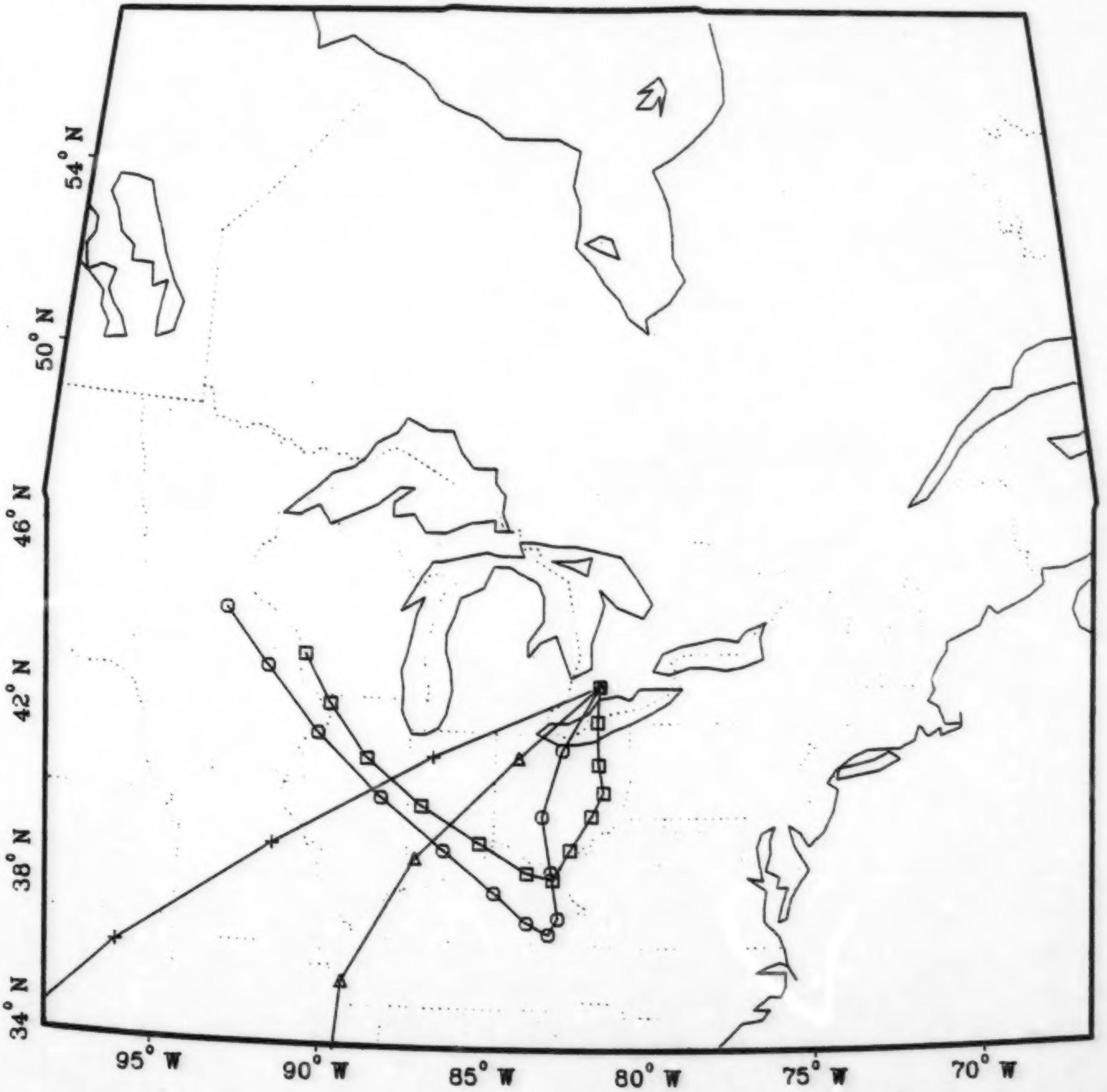

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.29.5

72 HOUR TRAJECTORIES
SUN NOV10 85 0 Z

	LONGWOODS (AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.29.6

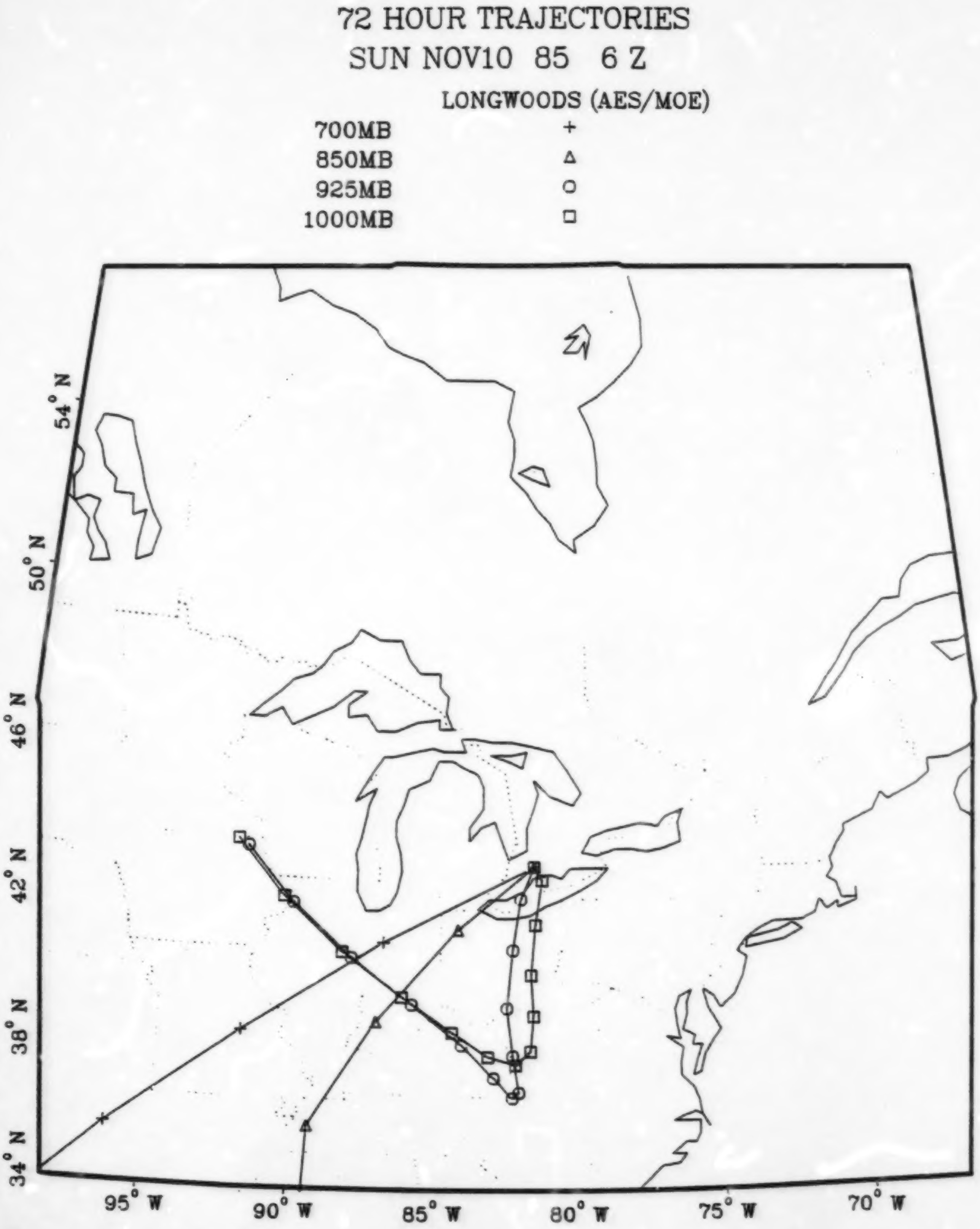

72 HOUR TRAJECTORIES
SUN NOV10 85 6 Z
LONGWOODS (AES/MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.29.7

72 HOUR TRAJECTORIES
SUN NOV10 85 12 Z

	LONGWOODS (AES/MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

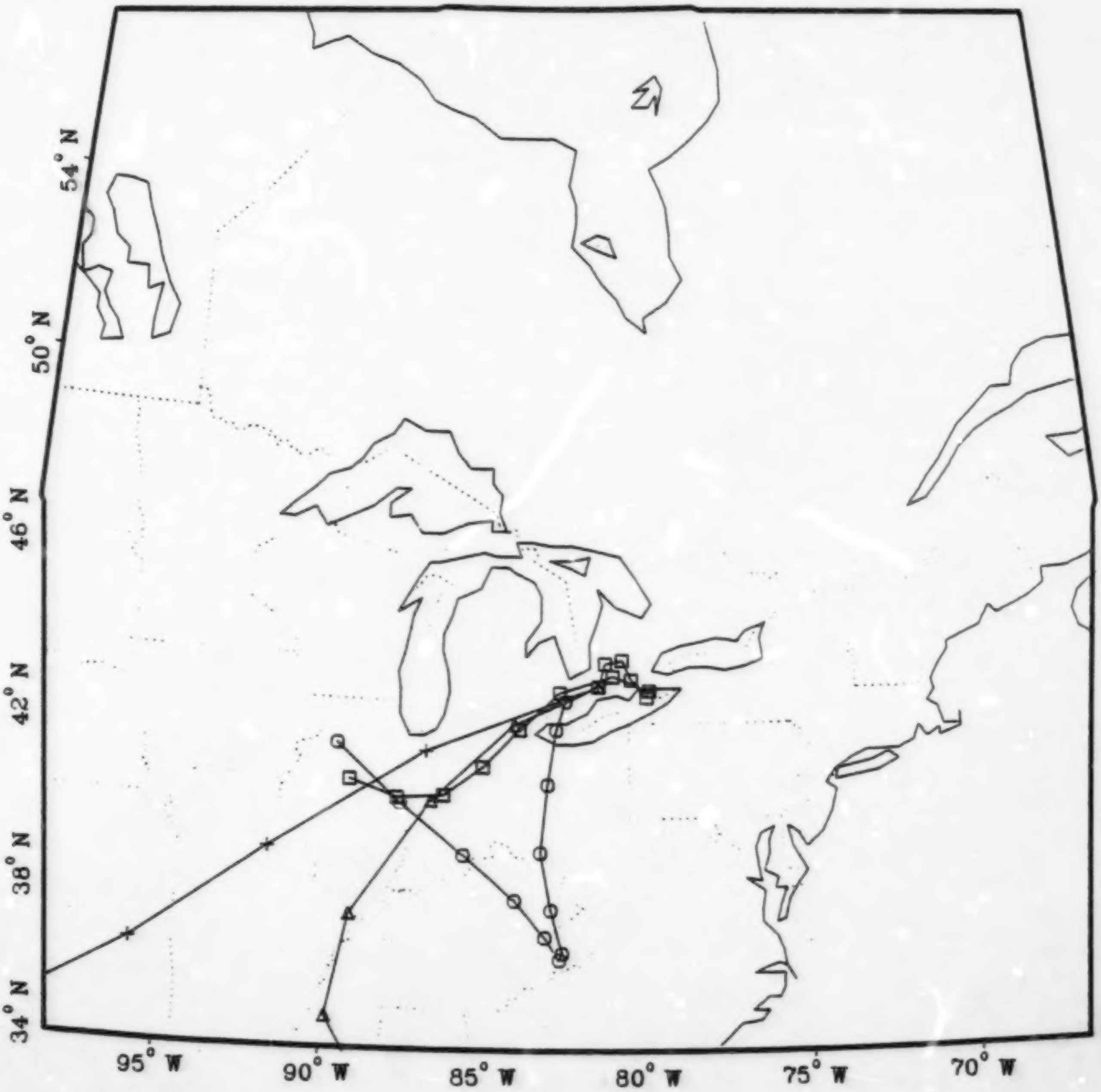

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.29.8

1.30 November 18-19, 1985, Dorset

This episode was ranked 6th (6/12) for the top 25% NO_3^- wet deposition events. It was not included in the top 25% $SO_4^=$ deposition events.

A low pressure centre over Kansas (outside the map boundary) with a frontal system and another frontal system with a wave over Kansas were observed on November 18, at 12Z as illustrated in Fig. 1.30.1. This low first moved NE and then backed to NW and on November 19, at 12Z it was situated over Minnesota as shown in Fig. 1.30.2. Another new low, 1006 mb, was observed over Lake Superior as shown in the figure. The frontal system also moved NE, and as the warm front approached the station, the associated continuous precipitation area enlarged covering Dorset. The precipitation began on Nov. 18 after 22Z as shown in Fig. 1.30.3. Unfortunately, complete precipitation observations are not available but it is certain that rain fell well after 06Z on Nov. 19. On Nov. 19, at 12Z, as exhibited in Fig. 1.30.2, the warm front had just passed the station and was also just outside the continuous precipitation area.

The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Dorset for November 18, at 12Z, 18Z and November 19, at 00Z, 06Z and 12Z are shown in Figures 1.30.4, 1.30.5, 1.30.6, 1.30.7 and 1.30.8 respectively.

Air trajectories for the 1000 mb level show that NO_x from the highest emission Chicago area on Nov. 18. at 12Z, as shown in Fig. 1.30.4 and from high emission St. Louis (Fig. 1.30.5), Detroit (Fig. 1.30.6) and Cleveland (Fig. 1.30.7) areas could have been transported.

Air parcels arriving at the 925 mb level could have carried NO_x from the highest emission Chicago (Fig. 1.30.4-5), and high emission Detroit (Fig. 1.30.6) areas could have been carried. Transport from St. Louis and Cleveland area for a short time was also possible.

Air trajectories for the 850 mb level show that NO_x from the high emission Detroit (Fig. 1.30.6-7) and possibly from the highest emission Chicago (Fig. 1.30.5) for a short duration could have been carried.

Air trajectories at the 700 mb level show that NO_x from the highest emission Chicago (Fig. 1.30.5-6&8) and high emission St. Louis (Fig. 1.30.5-8) could have been transported.

In summary, a warm front passage yielded rain showers and rain for about 10 hours. Low level and high level transport of NO_x from the highest emission Chicago area and from high emission Detroit, St. Louis area were probable.

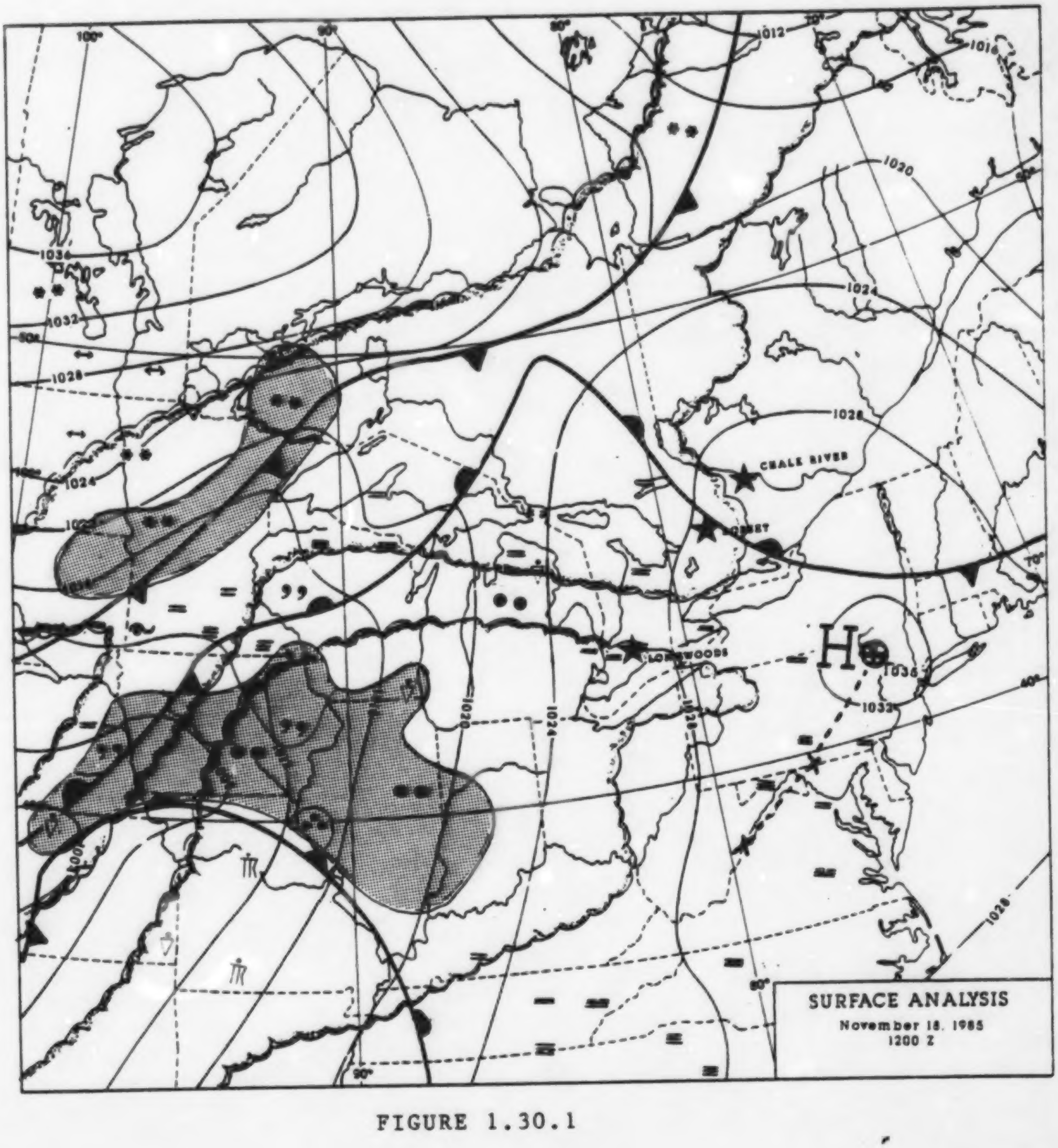

100°
90°
80°
70°
1012
1016
1020
1024
1028
1032
1036
50°
40°
CHALK RIVER
FOREST
LONGWOODS
H
SURFACE ANALYSIS
November 18, 1985
1200 Z

FIGURE 1.30.1

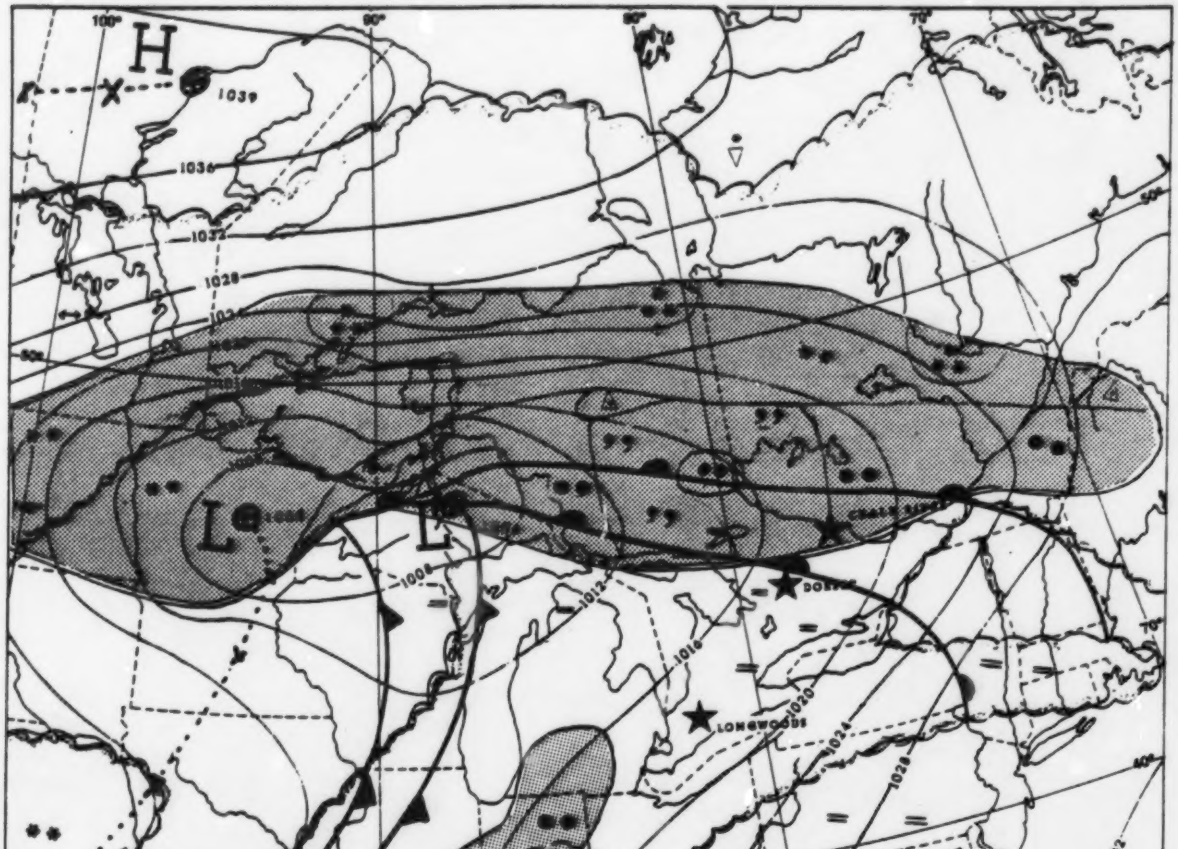

100°
90°
80°
70°
90°
80°
50°
40°
H
1039
1036
1032
1028
1024
L
1008
L
1012
1016
1020
1024
1028
1032
1008
LONGWOODS
DORSET
CHALK RIVER
L
SURFACE ANALYSIS
November 19, 1985
1200 Z

FIGURE 1.30.2

Muskoka A
Nov. 18-19, 1985

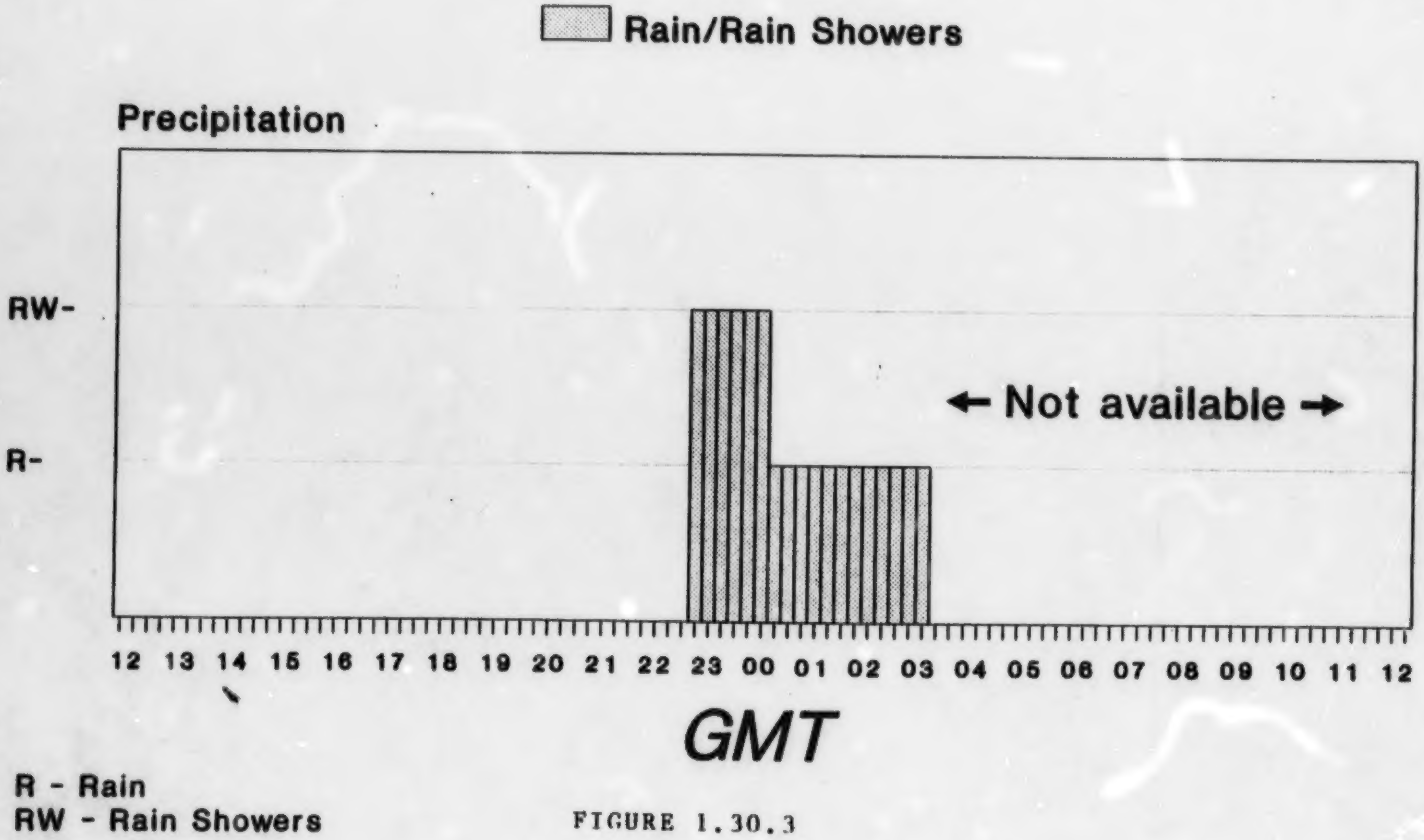


FIGURE 1.30.3

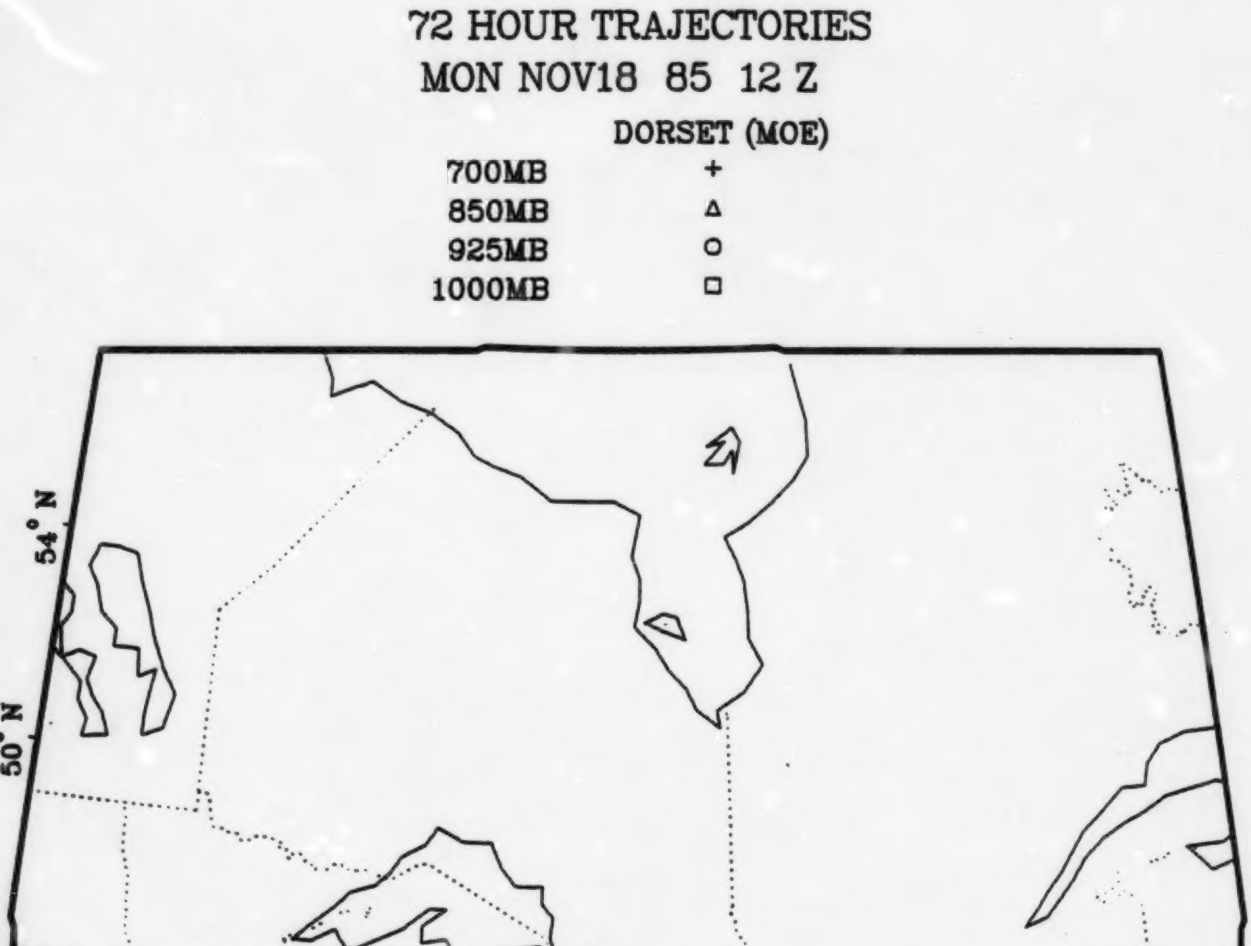

72 HOUR TRAJECTORIES
MON NOV18 85 12 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.30.4

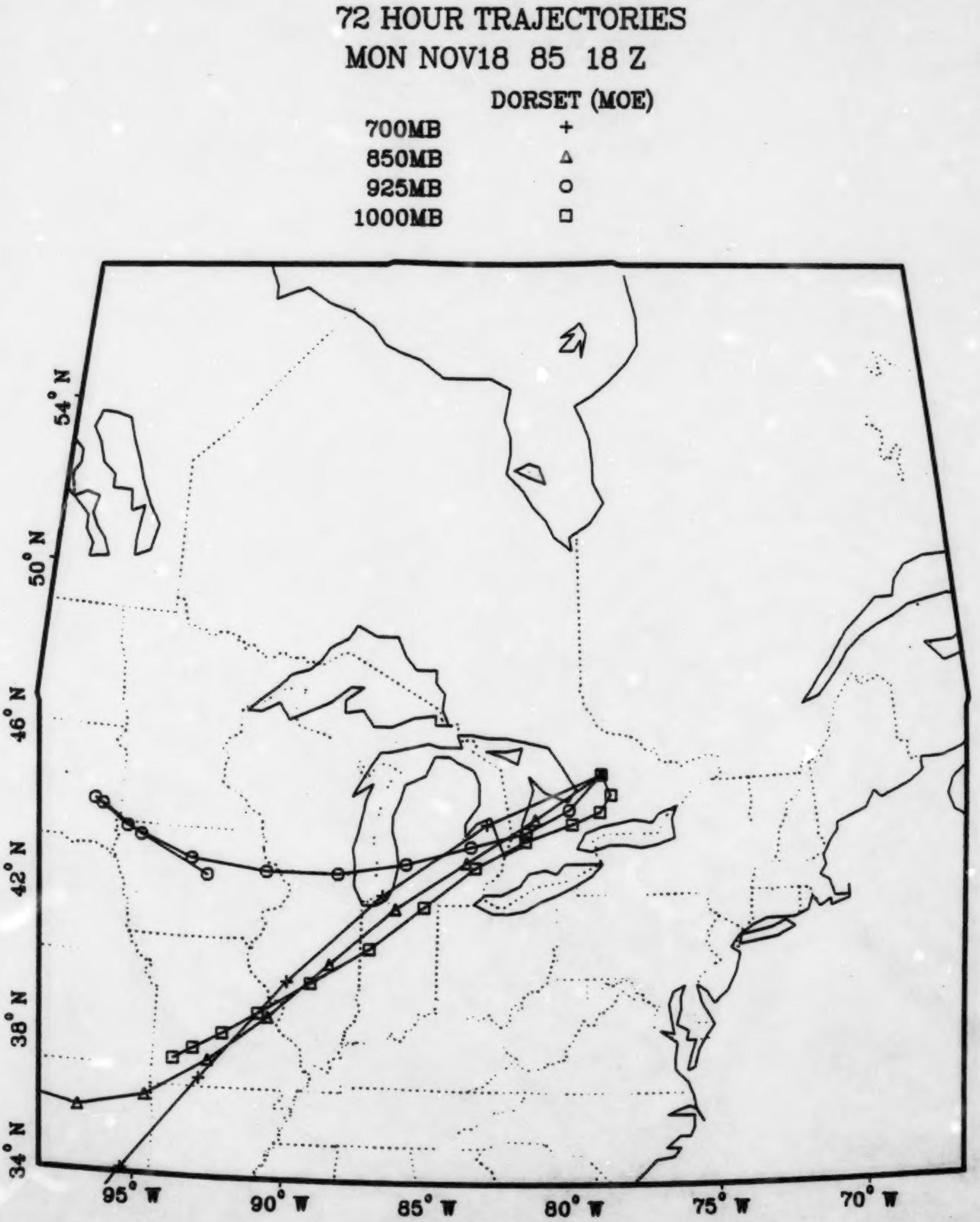

72 HOUR TRAJECTORIES
MON NOV18 85 18 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.30.5

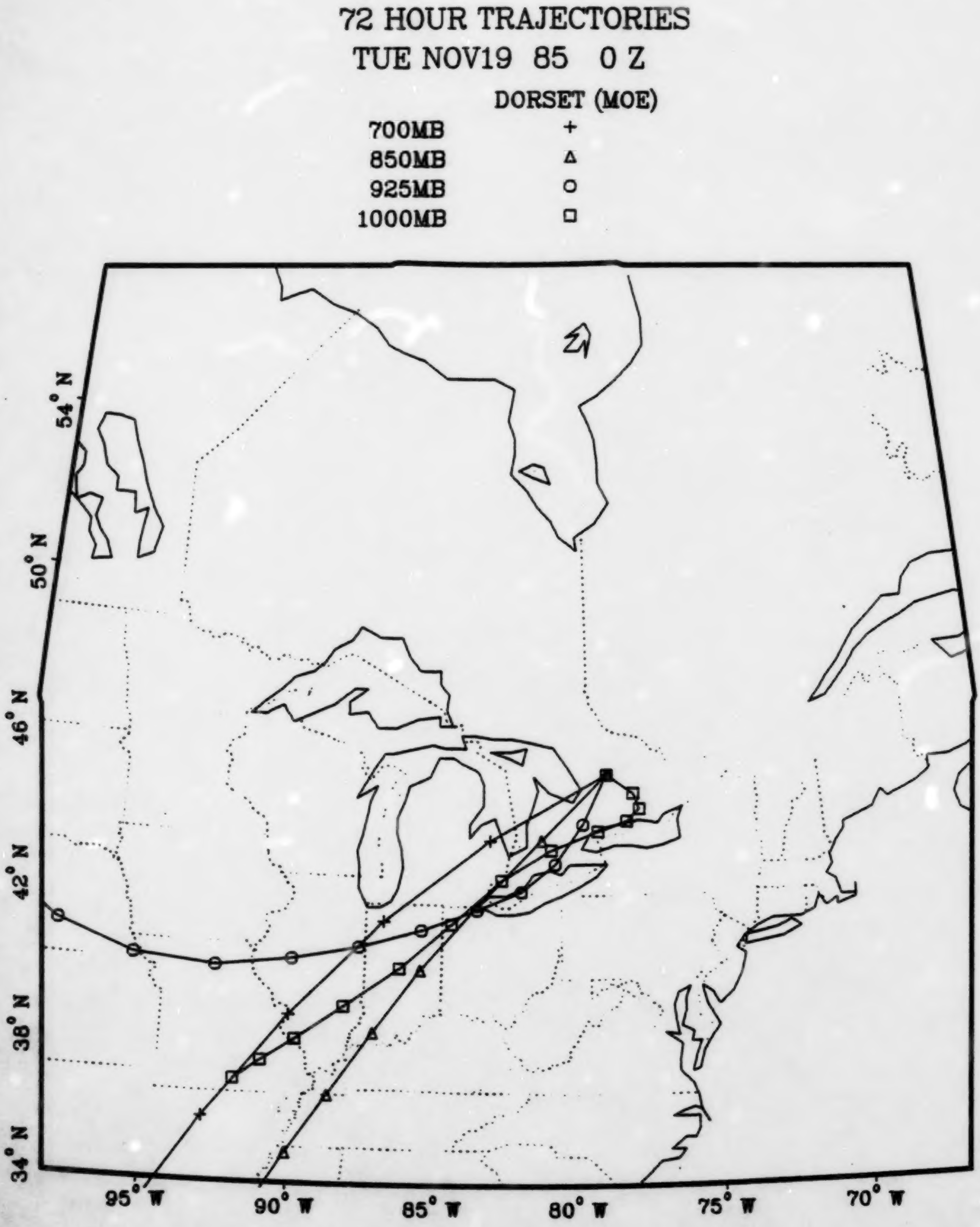

72 HOUR TRAJECTORIES
TUE NOV19 85 0 Z
DORSET (MOE)
700MB +
850MB Δ
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.30.6

72 HOUR TRAJECTORIES
TUE NOV19 85 6 Z

DORSET (MOE)
700MB +
850MB △
925MB ○
1000MB □

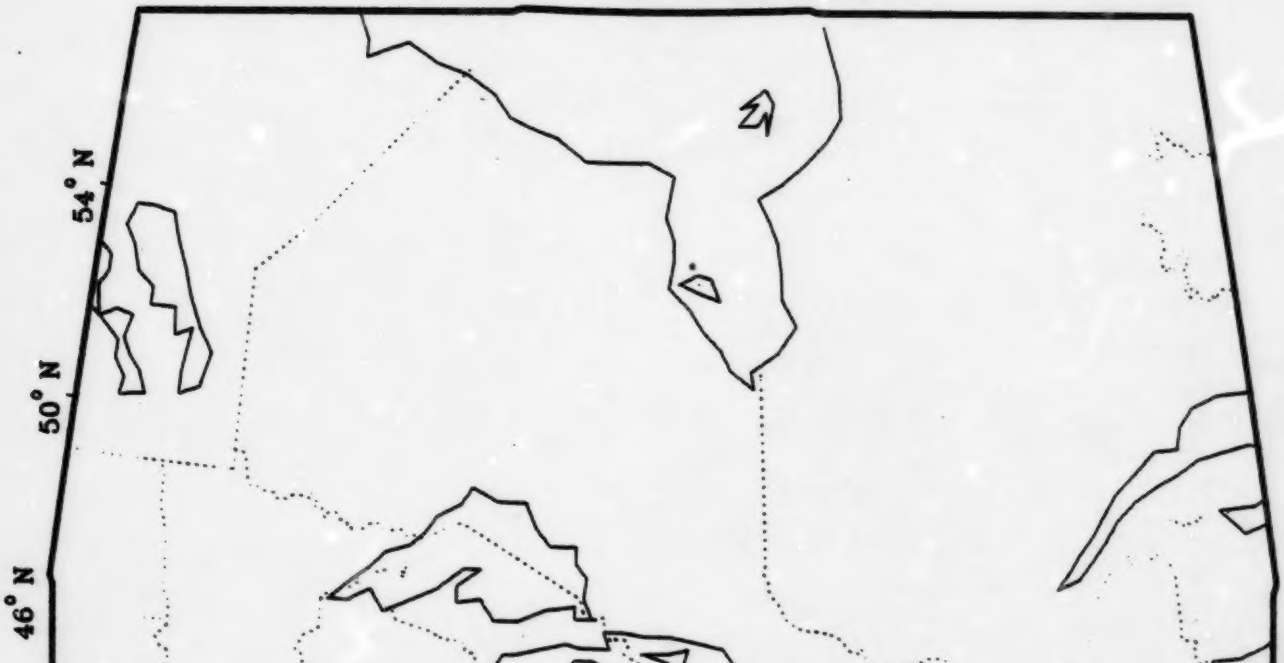

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.30.7

72 HOUR TRAJECTORIES
TUE NOV19 85 12 Z

DORSET (MOE)

700MB +
850MB △
925MB ○
1000MB □

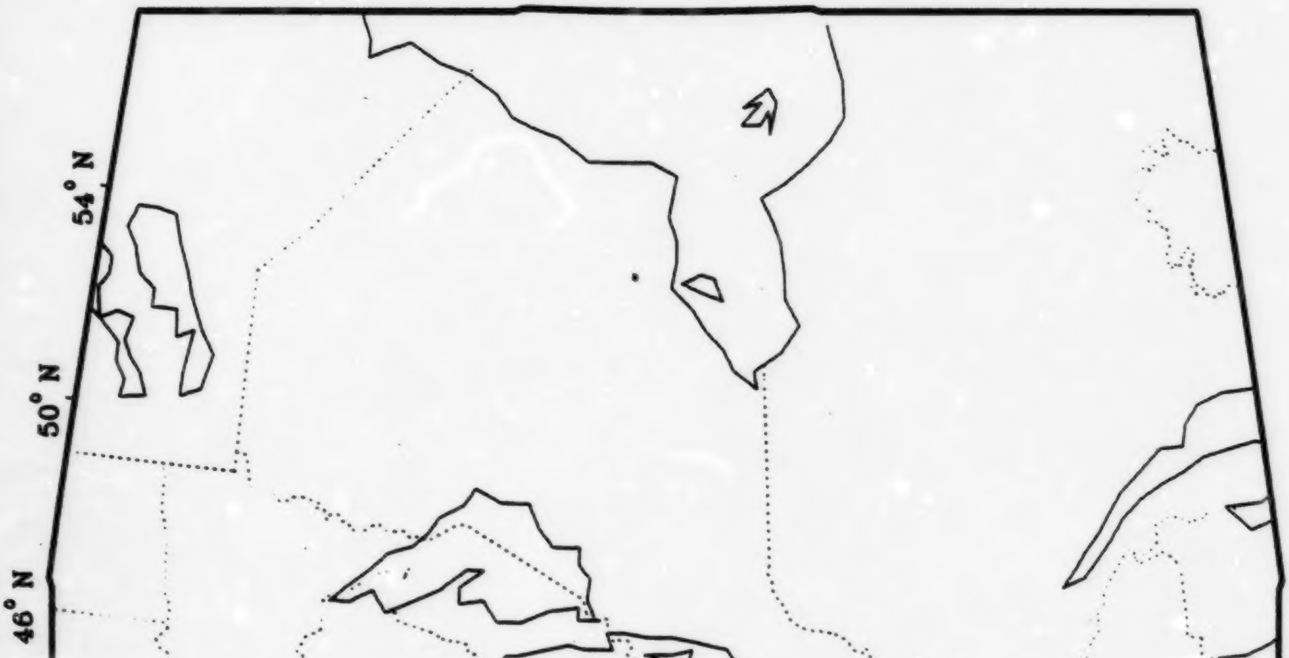

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.30.8

1.31 December 10-11, 1985, Longwoods(MOE)

This episode was ranked 4th (4/10) only in the top 25% NO_3^- wet deposition events for Longwoods (MOE).
A low pressure centre, 1018 mb, over Illinois-Indiana border south of Chicago, associated with a frontal system was observed on December 10, at 12Z as shown in Fig. 1.31.1. The low first moved NE and the warm front passed over the station and Longwoods was in the warm sector on Dec. 10, at 18Z. The low then moved ESE and was located west of Buffalo on Dec. 11, at 00Z. The cold front moved SE. Afterwards, the low moved E and the cold front remained south of Canada. On Dec 11, at 12Z, as shown in Fig. 1.31.2, a quasi-stationary front in an EW direction over Indiana, Ohio,Pennsylvania was analyzed. A large continuous precipitation area associated with the system yielded snow, rain and drizzle over Longwoods area as shown in Fig. 1.31.3. The total duration of precipitation was about 13 hours.
The 72hr backward air trajectories for 1000 mb, 925 mb, 850 mb and 700 mb at Longwoods for December 10, at 12Z, 18Z and December 11, at 00Z, 06Z and 12Z are shown in Figures 1.31.4, 1.31.5, 1.31.6, 1.31.7 and 1.31.8 respectively.
Air trajectories for the 1000 mb level show that they did not pass over any NO_x highest emission region but could have carried NO_x from the high Cleveland region (Fig. 1.31.4-6).
Air trajectories for the 925 mb level show that NO_x from the highest emission Chicago area (Fig. 1.31.4 &7-8) and high emission Detroit (Fig. 1.31.4), Cleveland (Fig. 1.31.5) could have been transported.
Air trajectories for the 850 mb level show that NO_x from the highest emission Chicago (Fig. 1.31.4 & 6-8) and from high Detroit (Fig. 1.31.4-5) areas could have been transported.
Air parcels arriving at the 700 mb level could have carried NO_x from the highest emission Chicago area as shown in Figs. 1.31.5-8.
In summary, a warm front passage and nearby low and cold front yielded snow, rain and drizzle for about 13 hours. Low level (925 mb) and high level (850 mb & 700 mb) transport of NO_x from the highest emission Chicago area and from high emission Detroit and Cleveland areas was likely.

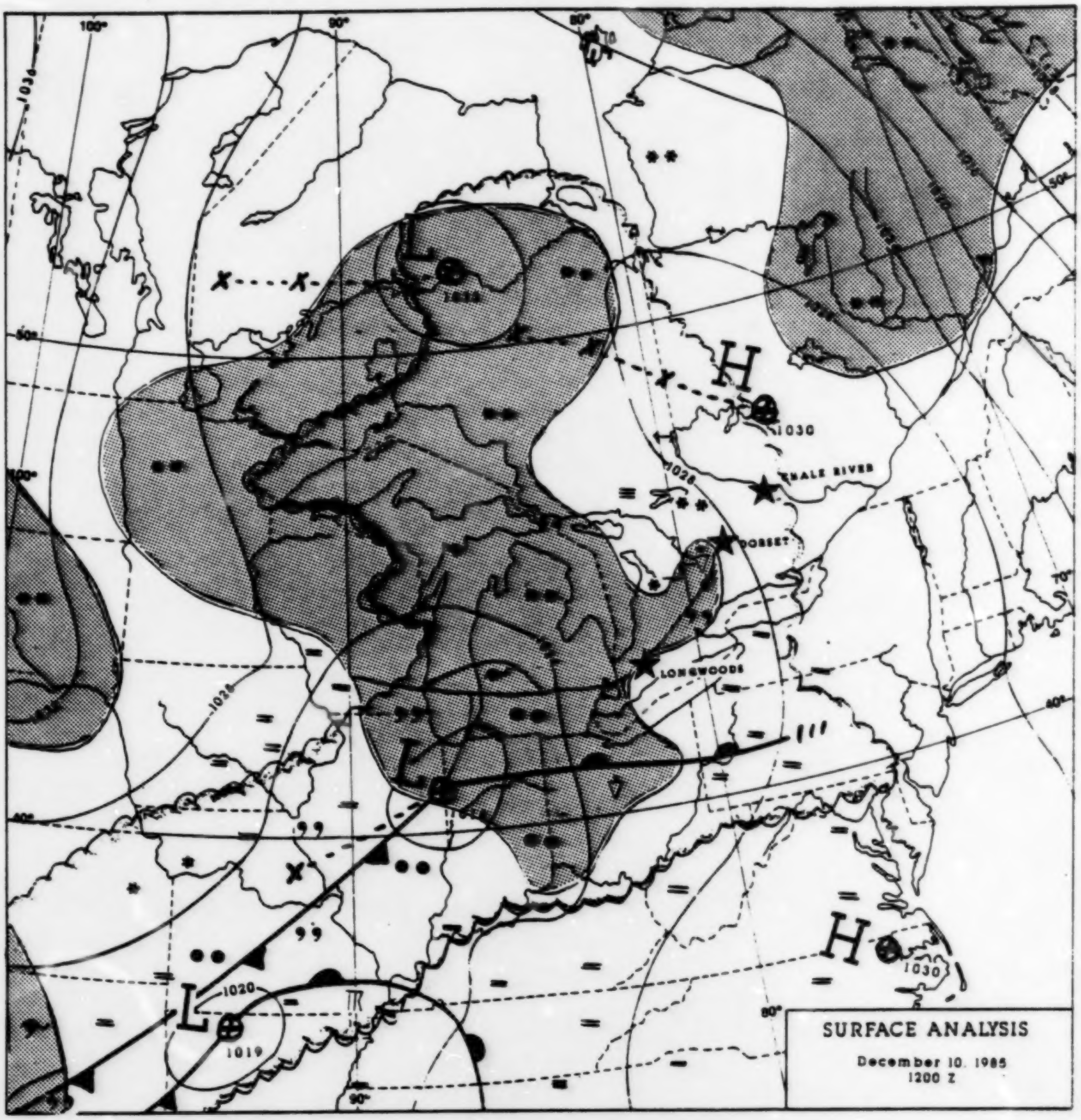

100°
90°
80°
70°
50°
40°
H
1030
1028
WHALE RIVER
DORSET
LONGWOODS
L
1020
1019
H
1030
SURFACE ANALYSIS
December 10, 1985
1200 Z

FIGURE 1.31.1

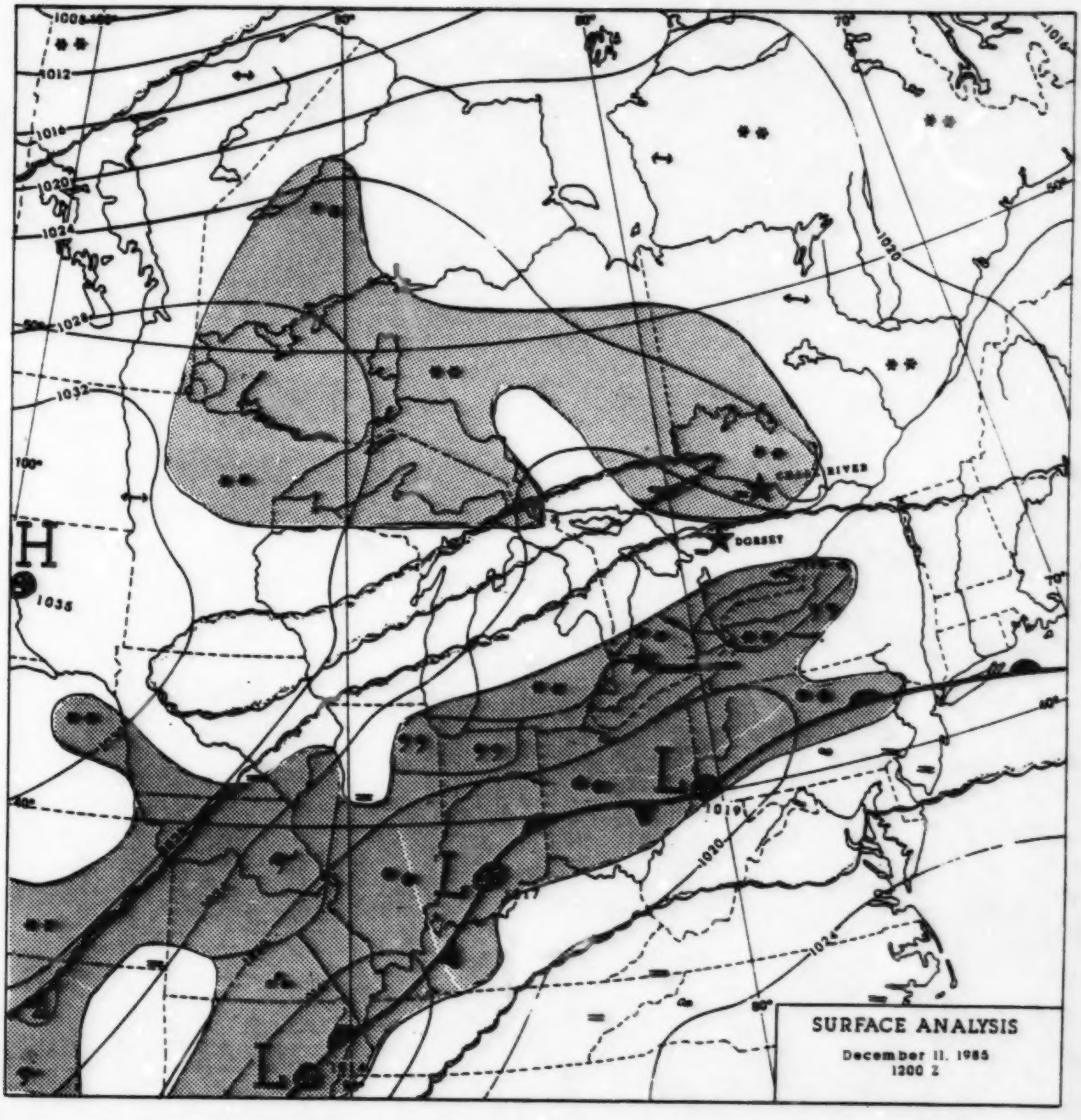

SURFACE ANALYSIS
December 11, 1985
1200 Z
CHALK RIVER
DORSEY
H
L
L
L
1008
1012
1016
1020
1024
1028
1032
1036
1019
1020
1024
1016
90°
80°
70°
100°
50°
40°
70°
80°

FIGURE 1.31.2

London A
Dec. 10-11, 1985

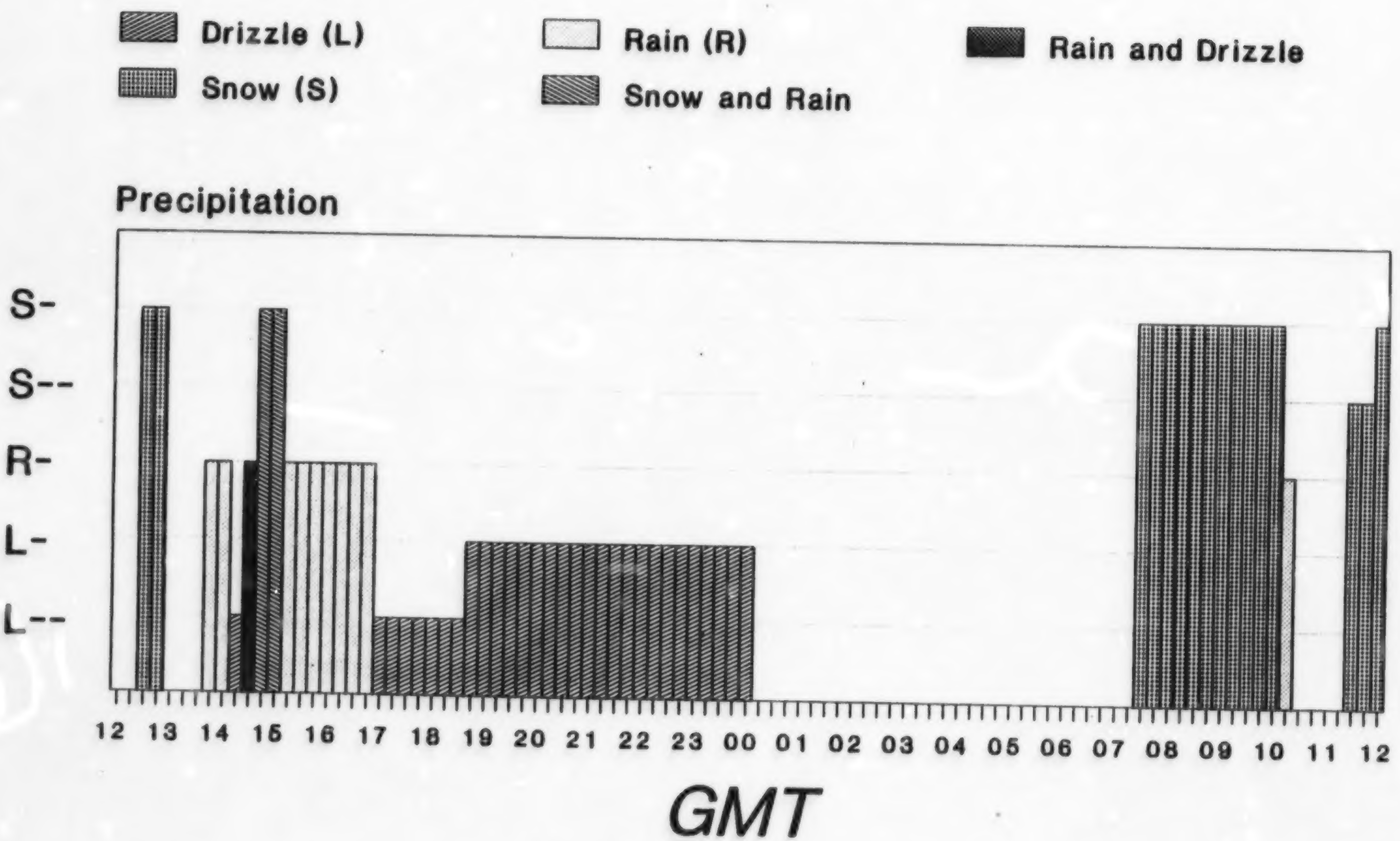


FIGURE 1.31.3

72 HOUR TRAJECTORIES
TUE DEC10 85 12 Z

	LONGWOODS (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

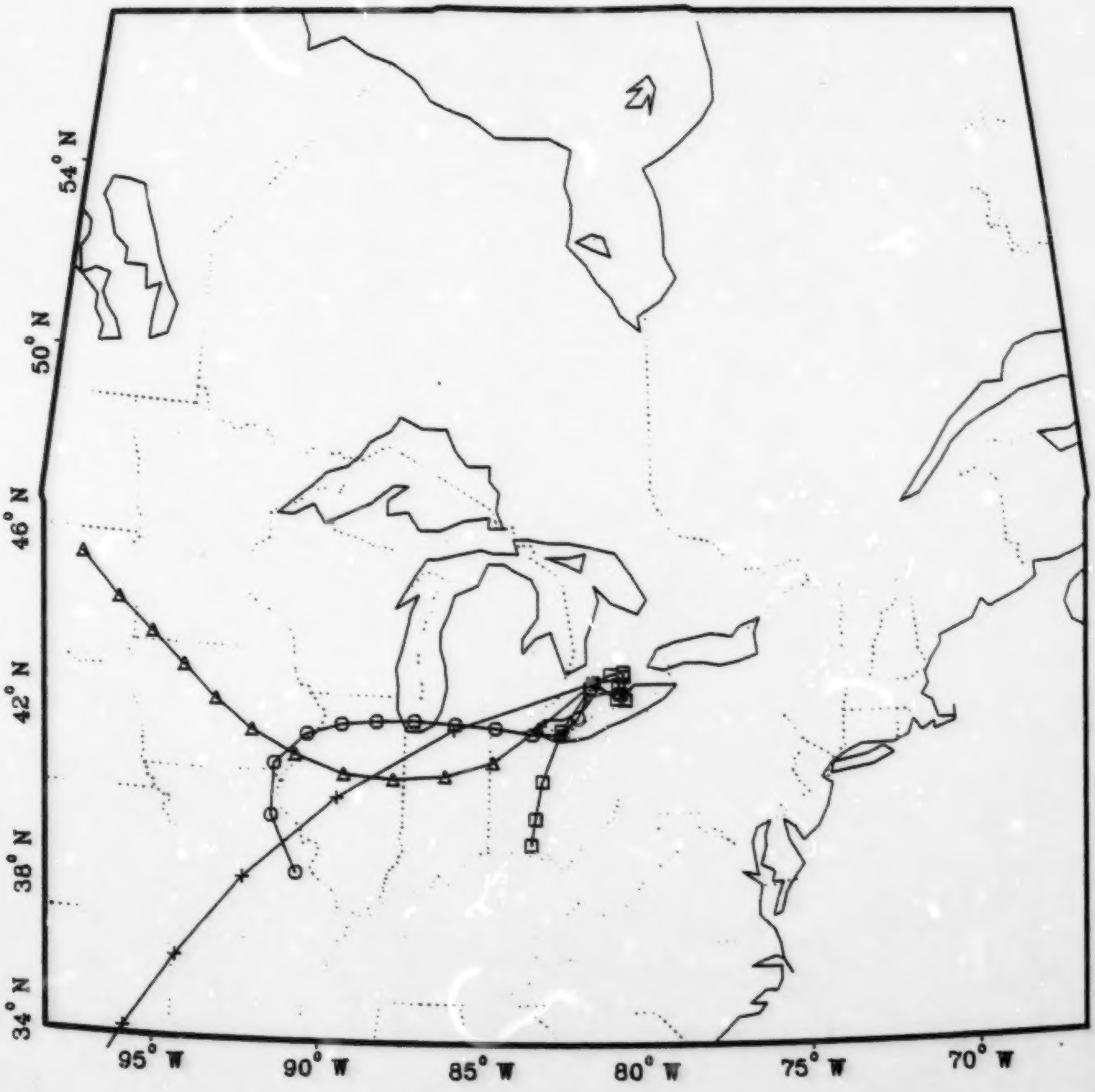

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.31.4

72 HOUR TRAJECTORIES
TUE DEC10 85 18 Z

	LONGWOODS (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

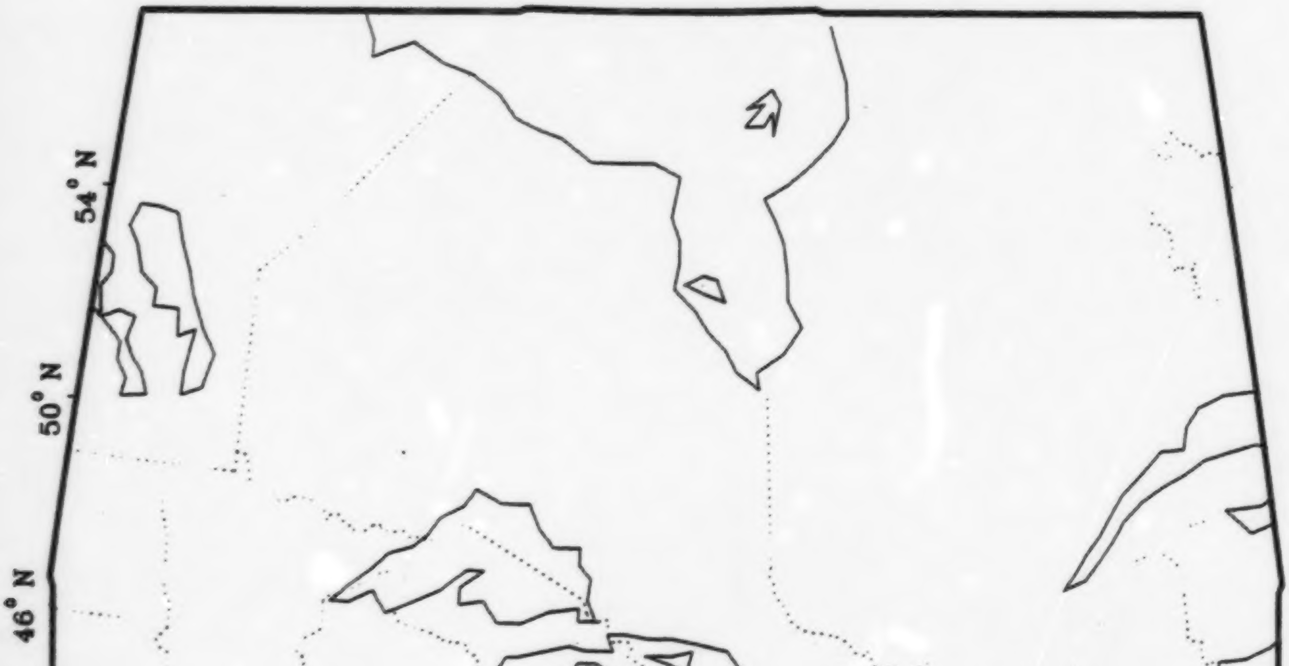
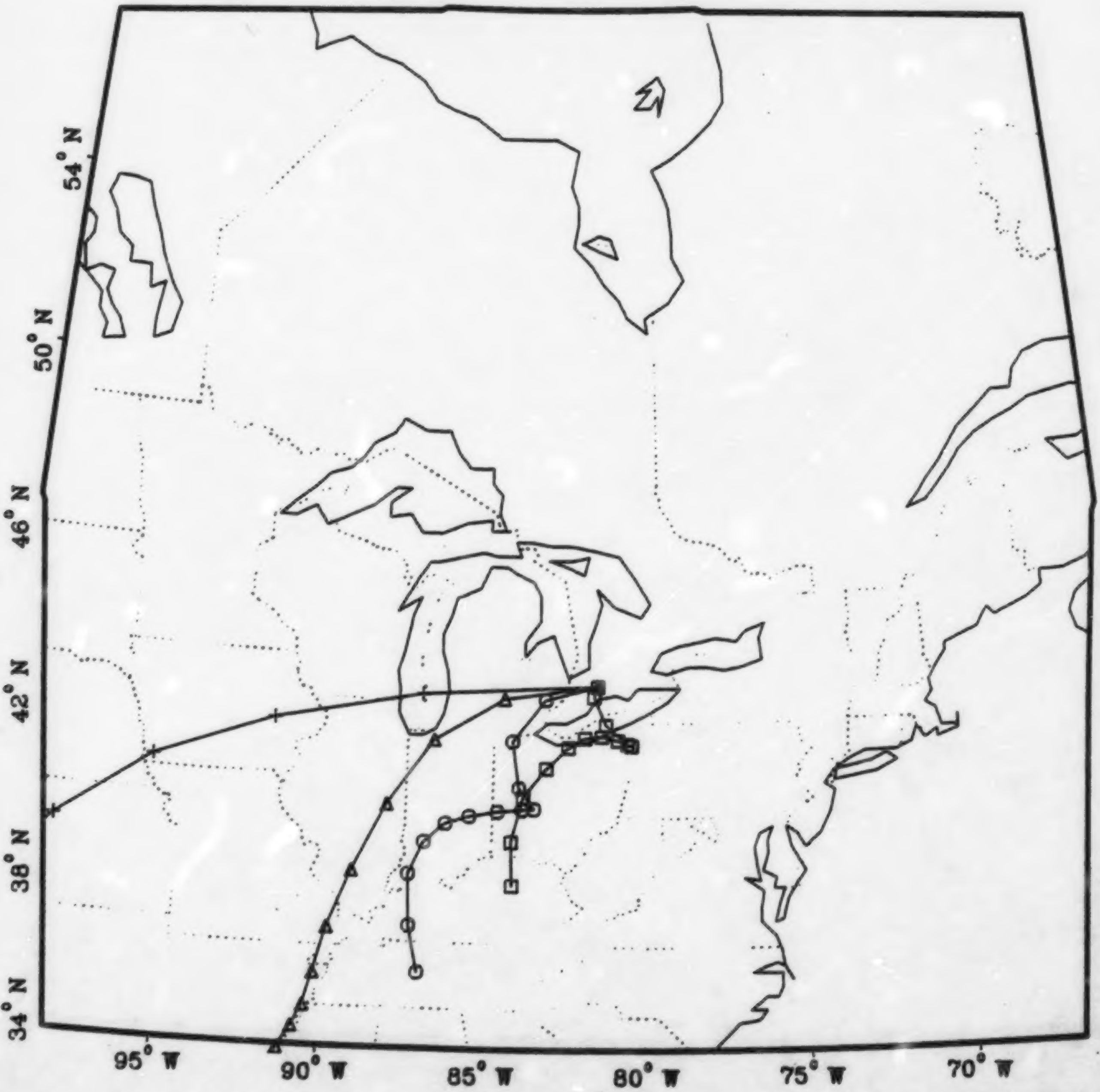

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.31.5

72 HOUR TRAJECTORIES
WED DEC11 85 0 Z

	LONGWOODS (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□



54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.31.6

72 HOUR TRAJECTORIES
WED DEC11 85 6 Z

	LONGWOODS (MOE)
700MB	+
850MB	△
925MB	○
1000MB	□

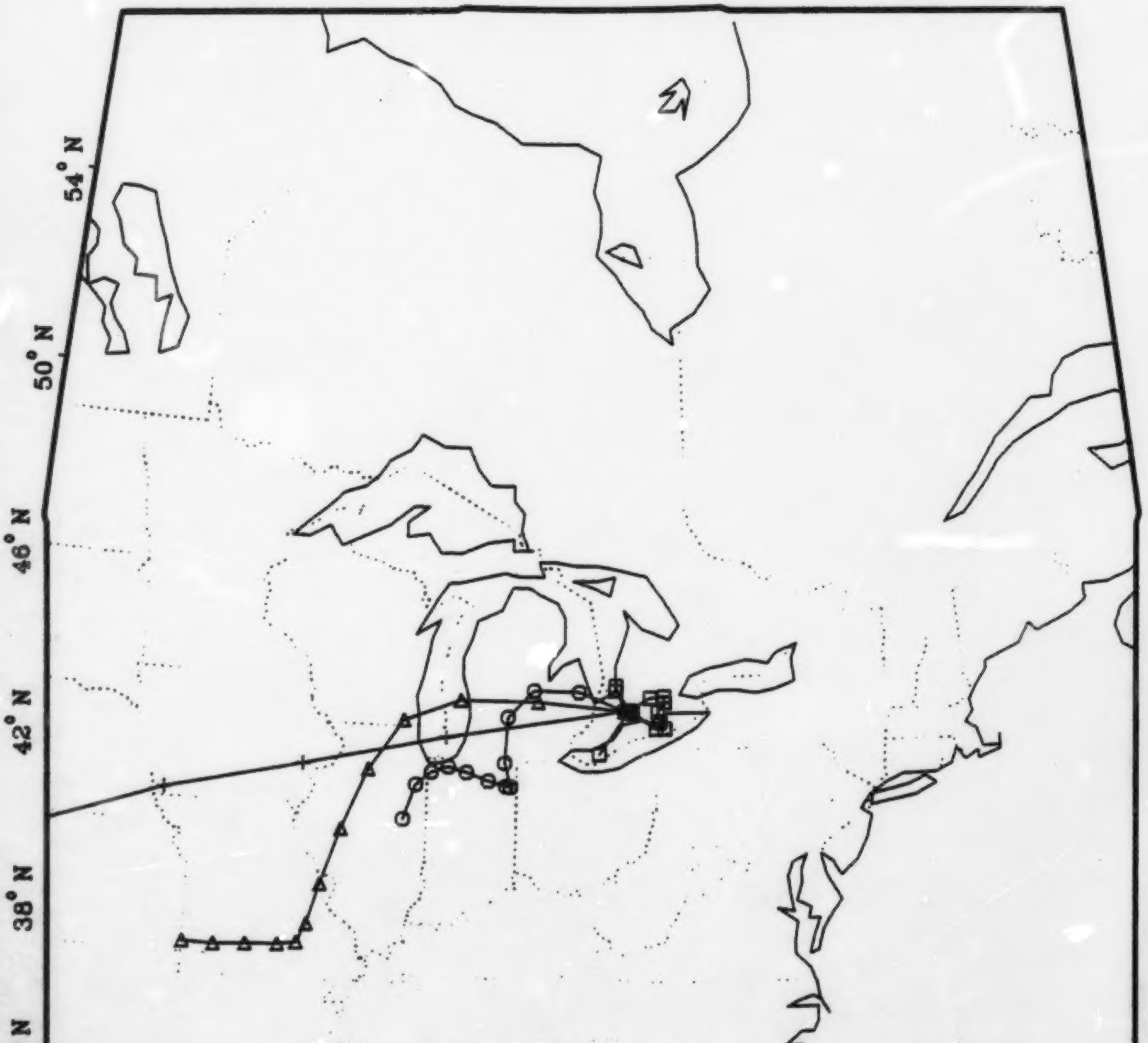

54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.31.7

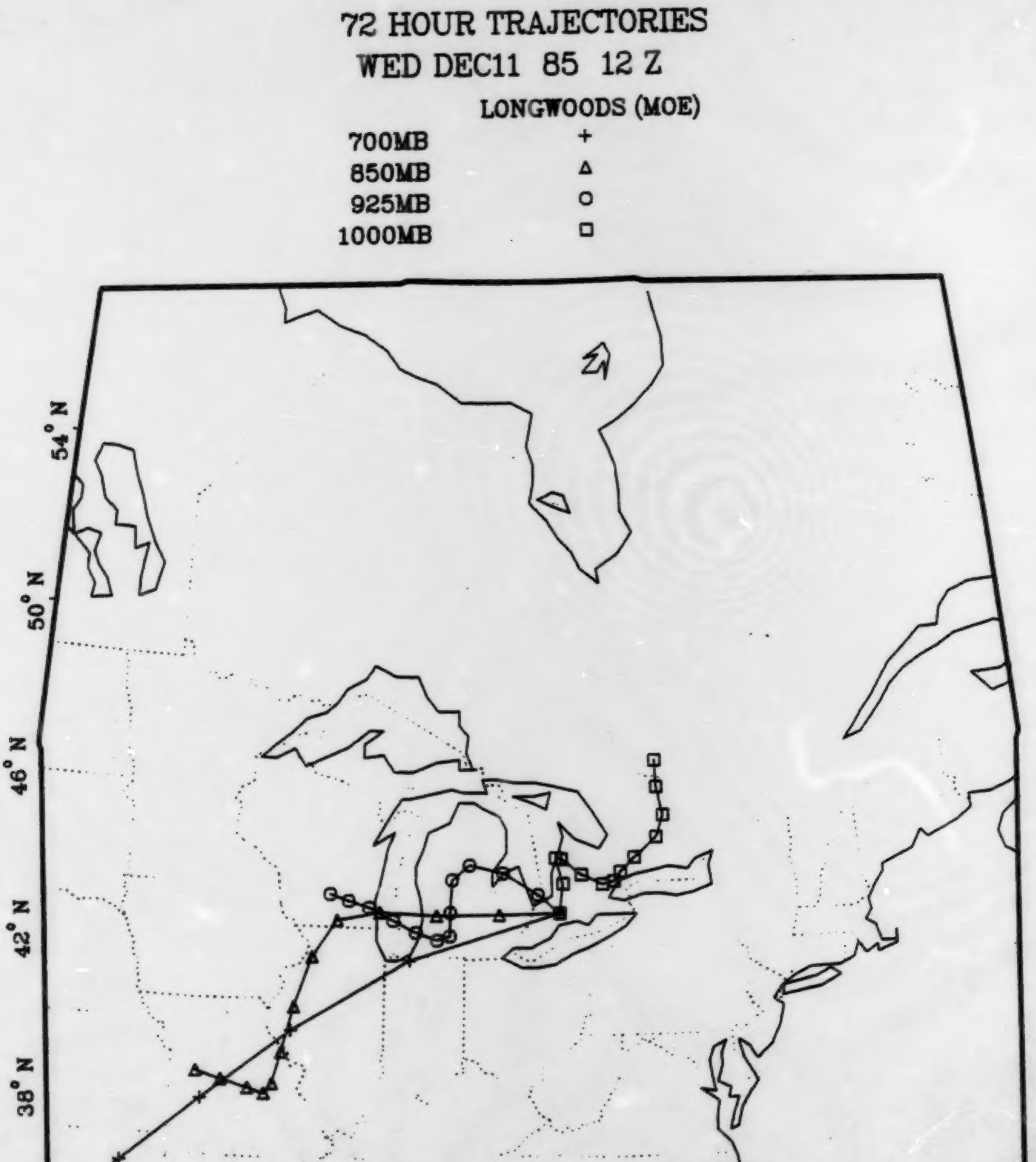

72 HOUR TRAJECTORIES
WED DEC11 85 12 Z
LONGWOODS (MOE)
700MB +
850MB △
925MB ○
1000MB □
54° N
50° N
46° N
42° N
38° N
34° N
95° W
90° W
85° W
80° W
75° W
70° W

FIGURE 1.31.8